

COAL AGE

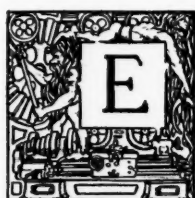
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Every Period Has Its Own Ambitions

BY R. DAWSON HALL



VERY active man has his ideals and purposes, and it is only in their accomplishment that he finds any pleasure. In every period of the world's history there has been a certain definite trend toward an ideal. If that ideal was one that was good for the world at large, then the results were good. But on the whole, much the same effort and much the same idealism always stirred active men regardless of the way in which they wended.

There has been a period when, as we put it, men strove solely for money. It would be better to say they sought for industrial power as measured pecuniarily, for nearly all the profit made they put back into industry. It was a period of real frugality. Few industrial leaders spent much money on their own comforts and pleasures. The captains of industry were master cogs in the industrial machine, who, while they helped to drive it with much noise and heat, were also driven by it. Their ideal was large industrial accomplishment. It was no mean ideal after all. It was often attacked by those whose ends were solely to acquire money and the comforts that went with it, and who wanted no part in the industrial machine, either as master cogs or as specks of sand on the brake wheel.

But there have been times when money figured but little, directly or indirectly. Many have represented them as better than the times of what they please to call "money-lust," but most of us know they were not. Thus it was in the days of the Crusades, when the desire of every active man was to spend himself in the wars, when the rich man was regarded with little but contempt. At other times the call that sounded largest to the world's leaders was to build spacious cathedrals, miles of cloisters and acres of nunneries. In others, as in England before the war, the aim of the idealist lay in public life and rarely, if at all, in making money. General approbation, whether in public or in private, whether expressed volubly at the hustings

or quietly by the fireside, was all that the Englishman of family believed was really worth the while.

They come and go these moods of men. Active men are always active in seeking such ends as present themselves as being worthy. Today it seems as if a new period approached when the leaders of men would aspire, not merely to control the finances of industry, but to be acclaimed leaders of the rank and file employed at their plants. They will care less about the dividends of their factories and, therefore, about the extension of them, than upon the reaction of their operations upon the lives and hearts of their employees and their families.

Ambition they will still have. They will still scurry along the road as before, but it will be a different road. A new goal as compelling and as pleasing as the one they will have deserted will lead them on.

Where before they looked at success of the industry, now they will look at turnover, not indeed as an uneconomical and inefficient leak in industry, but rather as being an evidence of their unfortunate unpopularity as industrial leaders. Where before they sought to lay off every unnecessary man, now they will try and keep all their employees working steadily, even at some loss, because the happiness of their men will be their aim rather than such success as will place them in control of larger industrial forces.

The change may come slowly, but it seems to be on its way. It will not be without its drawbacks to the Nation as a whole, and it will not be without its advantages. A sheltered workman is sometimes a contented man and produces a large product. Again, he is sometimes an inefficient man, seeing that efficiency is no longer a *sine qua non* for employment. In a nation when men are inefficient, wages must be low and living conditions hard. So the desire for the approval of the workingman may work to the detriment of that sheltered employee. The rough-and-tumble ideals of the passing day may after all—who knows?—be more kindly than the industrial-leadership ideal that seems to be likely to dominate tomorrow.

Vesta Coal Co.'s Modern System of Mine Haulage

BY RALPH W. MAYER
California, Pennsylvania

WESTERN Pennsylvania coal mines have some of the most extensive wire-rope haulage systems in the country. In some of the modern mines of this section underground and surface transportation of coal is effected by a combination of rope and electric haulage. The lowest coal haulage cost in the world, per ton-mile, from the working face in the mine to the point of consumption is probably that of the Vesta Coal Co., at California, Penn., a subsidiary of the Jones & Laughlin, Ltd., of Pittsburgh, Penn. The mines of this company possess a number of natural advantages all of which are fully utilized. The Jones & Laughlin company consumes the entire output of the Vesta mines, which in 1916 amounted to 3,000,000 tons; since that time this tonnage has been increased. These mines work steadier than operations which sell their coal in the open market, and thus the Vesta company is enabled to reduce overhead expenses.

The Vesta coal-haulage system includes electric motor transportation from the coal face to a central underground station where the motors leave their loads; a tailrope haulage system handles the cars from this point to the tippie. The haul from the tippie to the point of consumption is by water, the cheapest transportation known. The main electric haulage roads leading to the central gathering station vary, being from 2 to 5 miles in length; the central station is about 4½ miles from the tippie, which is on the Monongahela River. Thus the distance from the tippie to the innermost workings is something like 10 miles. The coal seam outcrops about 40 ft. vertically above the river and a steel trestle a half mile long connects the mine opening with the tippie (Fig. 1). The trestle and

haulage road with the unique overhead arrangement for carrying the electric power cables is shown in Fig. 2. The coal runs by gravity from the tippie into barges on the river and is unloaded again at its destination by huge power shovels. A conveyor line for loading coal into railroad cars near the tippie is shown in the background of Fig. 1, in the illustration to the left.

The coal seam is practically level in the Vesta mines, but in case of variation from this rule the dip is toward the river and in favor of the loads. The method of mining here includes main haulage roads driven on the butts of the coal; face entries are driven from the main roads, and butt entries, in turn, are driven from these face entries and practically parallel to the main haulage roads. Thus nearly all the rooms turned off the butt entries are driven on the face of the coal and mining is facilitated thereby. Throughout the mine the tracks are run right up to the face, no coal being shoveled twice; it is shoveled direct from the bottom at the face in both rooms and entries.

Mechanical haulage is used exclusively at the Vesta mines, no animal transportation of coal being employed at all at this plant. There are 44 electric haulage locomotives used underground here, a 30-ton six-wheel motor being the largest size in service at these mines. Thirteen-ton motors are used generally on main haulage roads. The gathering motors are 4-, 6-, 8- and 10-ton machines equipped with cable and reel to enable the motors to run into rooms. The gathering motors handle the cars from the partings on the main haulage roads to the rooms.

All main haulage roads meet at a central station where

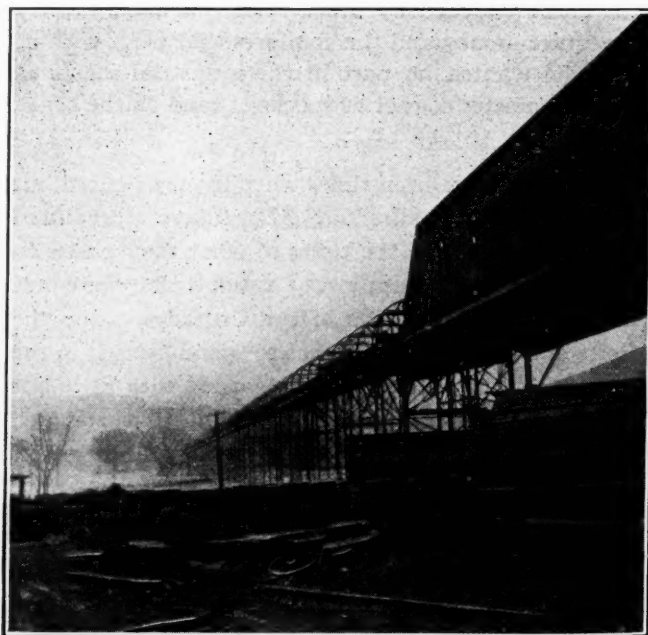
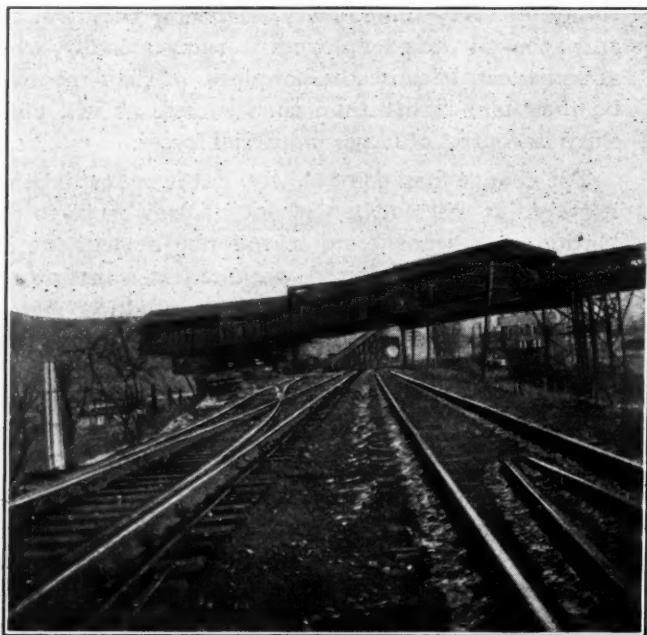


FIG. 1. VESTA COAL CO.'S NO. 4 PLANT ON THE MONONGAHELA RIVER IN PENNSYLVANIA
Left—Tippie for loading barges; conveyor for loading railroad cars in background. Right—Steel trestle connecting tippie with mine

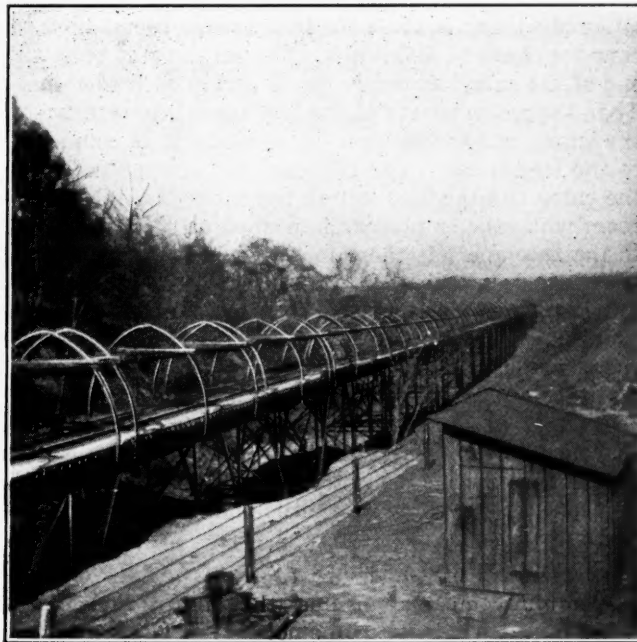


FIG. 2. VIEWS OF STEEL TRESTLE CONNECTING VESTA NO. 4 TIPPLE WITH THE MINE

the motors leave their trips of loaded cars. This station has both an empty and loaded track, each being about 2400 ft. long and holding some 240 cars. The length of the main haulage roads feeding this central station varies from 2 to 5 miles. The longest of these haulage roads has three partings and haulage sections on it, to which the gathering motors pull coal. The coal left by the gathering motors at the partings on this road is hauled by a 30-ton motor to the central gathering station. This giant motor is easily capable of handling 400 tons of coal on one trip; its usual load is about 100 cars. There are six main haulage roads; the five not covered by the 30-ton motor are served by 13-ton motors.

The section gathering stations on the main haulage roads are made by driving an entry through the solid coal. A pillar, locally called a rib, is left between it and the main haulage track. This entry is driven wide enough to accommodate both an empty and loaded track; it is usually about 1400 ft. long and parallels the main haulage track. Thus these local gathering stations serve as partings for the main haulage road, which is kept clear for through traffic at all times. Each of these partings is in charge of a parting boss who is under the supervision of a motor boss. The duty of the parting boss is to see that the empty cars are apportioned to the different motors of his section and that they are ready at the partings for the motors. He sees that the coal is hauled off the partings promptly so that there is no congestion of cars. In general he performs the duties of an assistant motor boss.

Various types of gathering motors are in use at the Vesta mines, some special motors being employed for specific purposes. For example, in sections where pillars are being robbed (locally called rib workings) the tracks run across the ends of the pillars, necessitating some sharp curves. Motors with a short wheel base are used for this work; also, motors with low frames are used in sections where the bottom has heaved or creep has occurred, leaving a low top.

All the entries have trolley wires, and when a gathering motor is about to enter a room, a copper hook on the end of the motor cable is hung on to the entry

trolley. The motorman fastens the trolley pole down to the motor frame. Steel rails are used entirely and act as the return circuit from the room face. On the face entries the track rails are connected to copper cables which act as the return circuit to the power house. The track rails in the rooms are not bonded but depend on the fishplates connecting the rails to carry the return circuit. All rails on entries throughout the mine are bonded with copper connections. Two men form a motor crew—a motorman and a snapper—the latter coupling and uncoupling cars, attending to hand brakes and throwing switches.

The motors have a trolley pole on each side, various sections of the mine having the trolley wire on that side of the track best suited to local conditions. A clearance space of 2½ ft. is left between the cars and the rib of the entry on the side of the entry opposite the trolley wire. The wheels of all the motors are outside the motor frame, but they are protected by suitable frame construction against damage from accidents. Anyone who has had to do with a derailed motor appreciates how much easier it is to place re-railing devices under outside wheels than under those of the inside type.

All room switches have bridles on the latches, which are thrown with levers. The switch points are held in position by a weight on the lever. This lever may also be installed so as to act as an automatic switch for a car coming out of a room onto the entry.

In gathering cars from a panel of rooms the following method is adopted. The motorman runs the trip of empties into a nearby vacant room and leaves it there while he pulls the loads out of all the rooms. Starting at the inby end of the entry the loaded car is pulled out of each room in turn and left standing on the entry at the room until all the loads are out of the rooms. The motorman then shoves the loads up the entry toward the face until they clear the last room inby, the snapper meanwhile coupling them together as they move up the entry. He then backs the trip of empties into each room, starting at the outby room, and leaves the end car in each room.

In case pillars are being drawn on an entry and

no empty track is available in a vacant room, then the cars are changed differently. Commencing at the outby end of the entry, an empty car is left in each room neck. Then the motor starts at the last room inby and pushes the empty car to the room face, where it is coupled up to the loaded car. The two cars are now pulled out to the entry and the load left on the entry just inby of the room while the empty car is pushed up the room again to the face and left there to be loaded. This operation is repeated at each room in the panel. Then the loads are coupled up and moved to the nearest parting or gathering station. One motor gathers the coal from all the rooms on a butt entry and three to six motors collect the loads for each gathering station.

All coal in the Vesta No. 4 mine is brought from the face to the central gathering station by electric motors; from the central station to the tippie the transportation is by wire tailrope haulage over a single track road of 90-lb. steel rails. The entire output of the mine passes over this haulage or dilley road—coal as well as slate. This road also is provided with a

of Wilkes-Barre, Penn. It is probably the largest mine haulage engine in the United States. A 1000-hp. 25 x 48-in. engine handles the trips of cars from the power house to the tippie. A round trip on the dilley road is about 9 miles, and the run is made in from 17 to 22 min. when hauling coal. This includes the time required for making the four stops at the power house necessary to change the ropes from one haulage unit to the other. To make the trip in the time noted requires running at express train speed on some parts of the road. A good track and road bed are absolutely essential. As a matter of fact a wreck on the dilley road is practically unknown unless the haulage rope-breaks, or cars get away from the partings without a rope coupled to them.

In operation each trip carries a rider who signals the engine room when necessary by means of two light galvanized wires alongside the track. A piece of copper held against these wires closes the circuit and gives the signal. At regular signaling points a switch is used for this purpose. Signaling apparatus in the

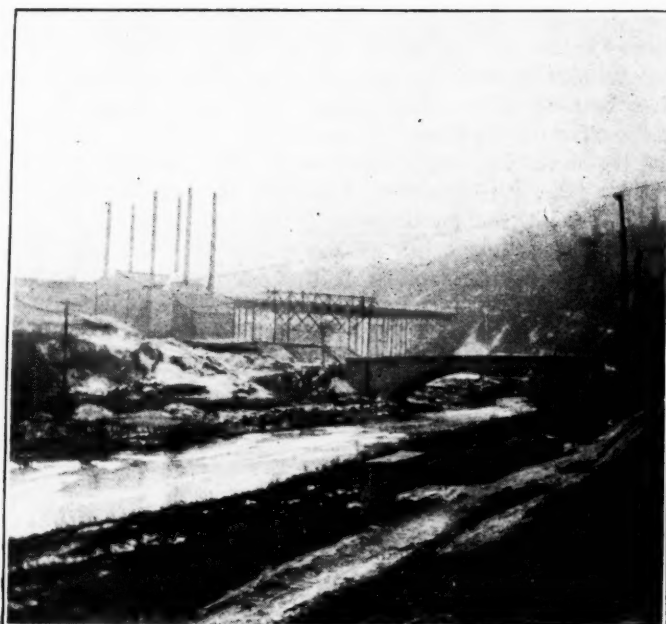
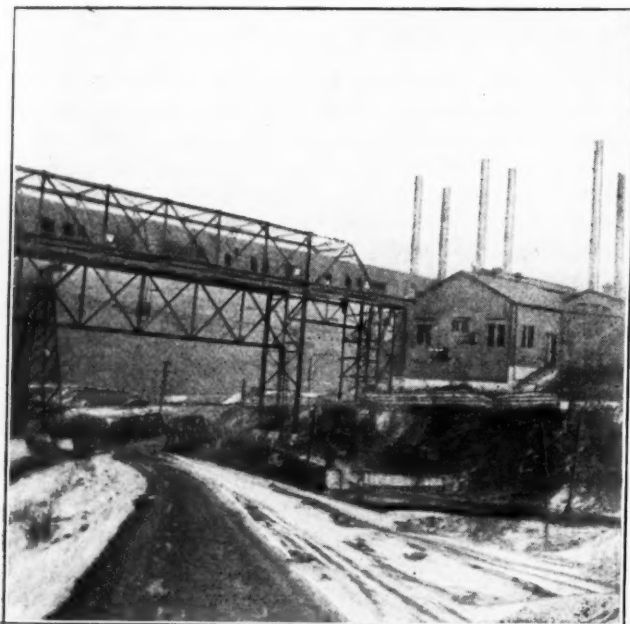


FIG. 3. POWER HOUSE AND TRETTLE CONNECTING HILLS NOS. 2 AND 3

trolley wire and is equipped for motor haulage. With the exception of some pillar work, no coal is being mined along the rope haulage road.

The rope haulage road underground follows the coal seam for about 4 miles of its length. Halfway, or about two miles from each end of this mine section, a gully cuts out the coal seam and the road is carried across from one hill to another by a steel bridge, shown in Fig. 3. The rope haulage engines and boiler plant are situated in this gully. The rope haulage is divided into two sections at this power house, one unit pulling the coal from the central gathering station as far as the power house, another unit handling it from here to the tippie. Each unit is independent, both as regards engines and boilers; both outfits are in the same building but in different rooms.

Each haulage engine in the power house (Fig. 3) carries on its drums 2200 ft. of 1-in. tailrope and 1100 ft. of 1½-in. headrope. The coal is pulled from the central station in the mine to the power house by a 3500-hp., 52 x 60-in. engine built by the Vulcan Iron Works,

engine rooms includes both a bell and a gong, and two sets of these signals are installed at each engine; if one set gets out of order the other set is thrown in circuit by means of a switch. Current for these signal wires is furnished by miniature dynamos.

Electrical power for the mine is furnished by three 750-hp., cross-compound engines operating generators delivering current at 550 volts. Eight Babcock & Wilcox stokers are used to fire the boilers in the large haulage unit and four of the same type of stokers are used on the other unit. The boiler-house coal is delivered by the rope haulage road. The dilley road passes under the roof of the boiler house and over the boilers. Cars with coal for the boilers are switched to a 1000-ft. sidetrack at the power house, where they are weighed. Then the coal is crushed preparatory to feeding it to the stokers; it is handled by rubber belt conveyors.

The dilley road is divided into four sections, each of which is inspected by a track walker before the man-trip runs over it in the morning. During the day these four men replace rope rollers and sheaves; the



FIG. 4. BRIDGE AND HAULAGE ROAD ENTERING HILL NO. 3

former carry the rope between the rails and the latter carry the return rope alongside the track. Miners and other employees are carried to work in the morning on the man-trip by rope haulage to the central gathering station in the mine, where the man-trip is split into three parts and each trip is hauled by a motor over the main haulage roads of the mine. There is an entrance to the workings at the end of the rope haulage system by which miners from the surrounding villages enter and get on one of these man-trips. The man-trips stop at the different face entries to allow the miners to get off at the nearest point to their work. In the evening the miners are collected and hauled out of the mine. The track grade is light and the danger of accident is reduced to a minimum.

The central gathering station is connected to the

tipple by a trunk line of single track, of 90-lb. rail. Eight miles of 90-lb. steel rails are used on the main haulage roads; the entries are laid with 50-lb. rail and the room tracks have 30-lb. rail. Wood ties are used. The mine has about 300 miles of track—175 miles in entries and 125 in rooms. When a room is finished or temporarily abandoned the track is removed. Few ties are used in rooms, the following plan being adopted: As the mining machines leave some bottom coal, channels are cut in it, the track rails are placed in these channels and connected with fishplates. This makes a firm even bed for the rails, track is prevented from spreading as the rails are held in position by the channel, and they are prevented from turning by ties placed at intervals, say at the end of machine cuts.

Ties are necessary at curves in rooms—for example, around the ends of pillars or in case track is carried into side cuts; here the motor would tend to pull the track out of alignment. Track rails are easily pulled out from under a roof fall; a short length of strong chain is used, being provided with a car coupling link at one end and a pair of fishplates bolted through the links in the other end. In removing a rail the fishplates on the chain are bolted to the exposed end of the rail and the other end coupled to an empty mine car; a motor then jerks out the rail. In this way several lengths of rail have been recovered from beneath a fall of rock.

In entries the inequalities of the bottom cause an uneven grade on tracks, unless provided for; the track is surfaced by raising low points with long blocks or wedges. This makes a firm and even road bed which is further secured by waste between the ties as ballast. No timbering which a runaway trip of cars might displace is used on the main haulage roads or on the dilley road. A large fully equipped motor repair shop and supply store room is situated about $\frac{1}{4}$ mile in by from the central gathering station. A second motor pit is being constructed nearly 4 miles inside this point at the innermost workings of the mine.

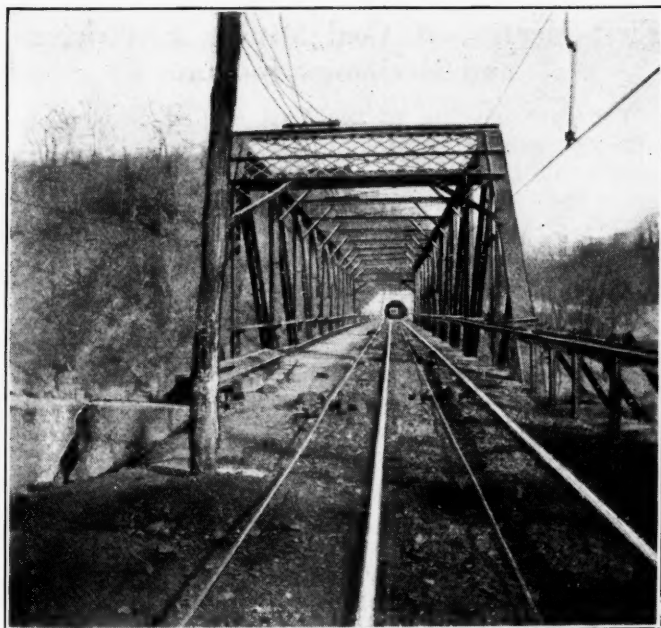


FIG. 5. ROPE HAULAGE ROAD AT VESTA NO. 4 PLANT

Left—Bridge between hills Nos. 1 and 2. Right—Portal to hill No. 1. Guard rails at the side protect the bridge and the masonry from runaway cars

The track gage is 48 in. A road boss under the mine foreman has general charge of all track and trackmen, together with their laborers. The trackmen, when working on an assistant foreman's section of the mine, usually take orders from the assistant foreman. The motormen report on forms the number of cars of coal, rock and bugdust hauled during the day. The number of cars in each trip is posted on a large blackboard at the central gathering station; this gives the total daily number of cars moved to the mine end of the rope haulage. At the power house, midway in the rope haulage system, the number of cars passing that point are posted on a blackboard. At the tippie an itemized count of the cars and the weight of each car is kept.

The mine cars at the Vesta No. 4 mine are mainly made of $\frac{1}{2}$ -in. sheet steel and the wheels have roller bearings. Stiff, double spiral springs slipped over the end of the drawbar under the car tend to lessen the strain on the car in starting and stopping. Special types of cars are used in this mine for specific purposes, such as cars for handling reels of cable or trolley wire, cars for hauling sand, water and various kinds of equipment.

Flare-up in Baltimore Tunnel

Cause of Catastrophe Still Unknown, but Evidently Was Not Due to Electricity Passing Through the Drawbars of the Mine Cars

AT 6:35 A.M. on the morning of June 5 a trip of 13 wooden mine cars, hauled by an electric locomotive, started into the water level drift, known as the Baltimore Tunnel, at the Baltimore colliery of the Hudson Coal Co. Investigations to date seem to establish: (1) That there were approximately 150 men riding in the empty cars; (2) that there were 14 twenty-five pound cans of black powder in the trip.

The powder seems to have been placed in the cars as follows: Seven cans in the rear car, one can in the third car from the rear, five cans in the fourth car from the rear and one can which was found outside the trip along the rib about opposite the fourth car from the rear.

The trip had proceeded to a point where the locomotive on the head end was approximately 150 ft. inside the mouth of the tunnel, the rear car being from 15 to 20 ft. inside the mouth of the tunnel. At this point a tracklayer, walking out of the tunnel, shouted to the motor runner that the trolley wire at a point about 200 ft. further in the tunnel was loose from a hanger. The motor runner stopped his trip, disconnected the electric locomotive from the trip and ran in a distance of about 250 ft. beyond where he left the trip standing and about 50 ft. inside the point where the trolley was loose from the hanger. He had about reached this point, stopped his locomotive and got off. Looking back he saw a flash in the trip. In some manner, not yet actually determined, the powder in the fourth car from the rear became ignited and in turn ignited the powder in the third car. After the ignition had taken place most of the men who were in the forward cars rushed back toward the mouth of the tunnel and, coming in contact with the flames and products of combustion by the powder, were either killed by burning or suffocation.

The total number of men who were killed or have since died in the hospitals is 91. The injured in the hospitals number 43, with a possibility of one or two of these men not recovering.

In August, 1918, a number of the men employed at Baltimore Tunnel refused to go to work because the foreman would not grant them an empty trip to go into the workings, the rules being that the men must walk in with their explosives. Some of the working faces to which these men had to walk were $2\frac{1}{2}$ miles from the mouth of the tunnel, the large percentage of them being over a mile from the mouth. The morning on which they refused to work, Mr. O'Hara, the mine foreman, and Mr. McCrystle, the assistant colliery superintendent, met the men and persuaded them to go to work and stated that they would meet the mine grievance committee in relation to the matter. The men, from time to time, had been in the habit, instead of walking to their working places to go as far as the inside of the tunnel and wait until an empty trip would go in, at which time they would "jump" the trip and ride in. This practice was difficult of detection and extremely hard to stop. Mr. O'Hara and Mr. McCrystle, after considering the whole matter, decided that in their judgment it would be safer to grant the request of the men for an empty trip at 6:30 a.m. each morning if the men on the mine committee would in turn agree that no powder should be carried except in the last car of the trip, and that no men should ride in either the last car or the car next to it. At the meeting with the mine committee this was agreed to, with a further provision that the mine committee would each morning check up the trip to see that each and every term of the agreement would be carried out. The mine foreman and assistant mine foremen from time to time checked up the trip and found the rule being obeyed, but on this particular morning the mine foreman was about 1000 ft. from the drift on his way to the office from his home when the trip went in.

The seven cans of powder in the rear car were not burned or exploded and were taken from the car intact after the accident.

First Meeting of Coal Mining Electricians and Mechanics Institute

The first meeting of the Coal Mining Electricians and Mechanics Institute was held in the Y. M. C. A. auditorium at Charleston, W. Va., May 29 and 30, with about 300 in attendance. In spite of excessive heat and the fact that May 30 was a holiday, much interest was manifested and everyone stuck to the finish.

In all, eleven papers were presented, most of them illustrated with moving pictures or lantern slides. Considerable interest was shown by the audience in the various papers, as was evidenced by the many questions asked and the discussions that arose. The educational advantages of such meetings were made clearly apparent and many expressions of satisfaction were heard on the large amount of information, applicable to everyday work, that was derived.

It should be remembered that those present voluntarily gave up a holiday and attended this convention in order to secure knowledge that would be of benefit to themselves and their employers. This speaks volumes for their enthusiasm. That the exchange was a wise one was the consensus of opinion among those present.

Coal Pyrite Resources of Tennessee*

BY E. A. HOLBROOK AND WILBUR A. NELSON

SYNOPSIS—Pyrite occurs in coal, usually in a more or less detached form. Experiments conducted upon certain Tennessee coal-mine refuse would indicate that such pyrite might be commercially extracted therefrom. The extraction plants would be simple and comparatively inexpensive.

THE brassy-yellow mineral pyrite (FeS_2), a combination of iron and sulphur often known as "fools' gold," is of common occurrence in many kinds of rocks. Commercially it is important only as the basis for the manufacture of sulphuric acid, an acid essential in the manufacture of explosives, fertilizers and other chemical products. On roasting, the pyrite gives up its sulphur to form the gas, sulphur dioxide, which in turn is converted into sulphuric acid in large chambers, chiefly by the use of steam.

Formerly most of the pyrite used in the United States came from Spain, although some sulphuric acid was manufactured by burning or roasting pure native sulphur mined in Louisiana. At the beginning of the present war the Spanish supplies were cut off and it seemed essential, in view of the increased demand for sulphuric acid, to develop every available source of supply in this country. Many pyrite mines were opened in the Appalachian Mountains, especially in northern Georgia; and increased attention was given to the sulphur deposits in Louisiana and Texas.

It is well known to those engaged in coal mining that frequently balls and bands of pyrite occur with the coal, and this impurity must be removed before the coal is placed on the market. Because the coal in a mine contains pyrite balls or bands, however, does not mean that the product of this mine is high in sulphur, or inferior in quality, for often the contrary is true; that is, the sulphur, having concentrated into definite balls and bands, leaves the true coal comparatively free from sulphur.

Knowing that there were possible pyrite resources in certain of the coal mines in Tennessee, the State Geological Survey effected a cooperation with the United States Bureau of Mines, by which a survey of the pyrite in Tennessee coal mines has been made, and favorable material has been tested in the laboratory used by the Bureau of Mines at Urbana, Illinois.

At the present time (October, 1918) it appears that the great demand for pyrite has been met, partly by an unexpectedly favorable development of new sulphur resources in Louisiana and Texas, and partly by development of pyrite mines in the Appalachian Region and in Canada. Also it has not been considered opportune to interfere in any way with the production of coal. For these reasons the demand for coal pyrite has not been as great as was expected earlier in the year. However the supply known to be available constitutes a great

reserve in time of need, and calls attention to a potential resource for the future.

This report outlines the known coal pyrite resources of Tennessee and details tests made at Urbana, Ill., on crude pyrite from the mines of the Bon Air Coal and Iron Corporation, to learn if the material could be mechanically treated to produce a pyrite of commercial purity.

Outside of the large deposits of pyrite and pyrrhotite in east Tennessee in the Ducktown region, the state has an additional source of pyrite from certain of the coal seams of the Cumberland Plateau.

The mines in the Bon Air-Clifty district all contain pyrite in the form of bands, nodules and kidneys, which are easily separated from the coal and can be recovered as a byproduct. It is estimated that the amount of

Original Material, 422 lb. 32.68% Sulphur					
Trial Test					
Crushed to $\frac{3}{4}$ -in. Maximum Size					
Jigged Without Sizing on a 2-compartment Jig					
1st Screen Bed Concentrates	1st Hutch Concentrates	2d Bed Middlings	2d Hutch Concentrates	Tailings (Coal)	Loss
156 lb.	24 lb.	119 lb.	26 0 lb.	63.0 lb.	34 lb.
37 0%	5 7%	28.2%	6 1%	14 9%	8 1%
43 1% S.	44.0% S.	36.7% S.	36 1% S.	5 3% S.	.....
				19 8% Ash	.....
Recrushed to $\frac{1}{4}$ -in. size					
Butchart Concentrating Table					
Concentrates	Middlings	Tailings	Loss		
85 lb.	8 lb.	19 lb.	7 lb.		
71 4%	6 7%	16.0%	5 9%		
41 6% S.	30 1% S.	12 3% S.			
		32.1% Ash			

NOTES.—1st Screen Bed Concentrates means the coarse concentrates saved on the 1st bed of the jig.

2d Hutch Concentrates means the fine concentrates passing through this screen and saved at the bottom of the jig.

Middlings means a product of pieces containing part coal and part pyrite which have to be crushed finer before any separation of clean pyrite can be made.

FIG. 1. FLOW SHEET OF COAL PYRITE CONCENTRATION MATERIAL FROM EASTLAND MINE

pyrite, if all is recovered, from the mines in this district when operating at full capacity will be at least 50 tons daily. This estimate was made to include all the mines operating on the Bon Air branch of the Nashville, Chattanooga & St. Louis Railway.

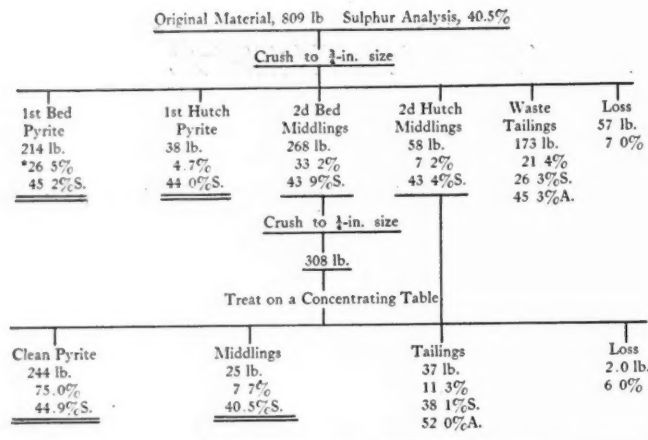
Clean samples of pyrite from some of these mines gave the following analyses:

Carola Shaft, Bon Air, Tenn.....	47.0 per cent. sulphur
Braeburn Mine, Eastland, Tenn.....	47.6 per cent. sulphur
Ravenscroft Mine, Ravenscroft, Tenn.....	46.4 per cent. sulphur

The mines on the Monterey branch of the Tennessee Central contain pyrite in a recoverable form. This pyrite is similar to that from the Bon Air district, on which tests were made. It is estimated that probably 40 tons of pyrite a day could be recovered from this district. Clean samples of pyrite were taken from some of these mines, which gave the following analyses:

Fentress Coal Co., Wilder, Tenn.....	46.4 per cent. sulphur
Peacock Mine, Big Mountain Coal Co., Obey City, Tenn., Weather surface pyrite	46.1 per cent. sulphur

*Article published in "The Resources of Tennessee," Vol. IX, No. 1. It is based on an inquiry made by the Tennessee Geological Survey in cooperation with the Bureau of Mines, through the Middle West Station of the latter, located at Urbana, Illinois.



*26.5% means that 26.5 per cent by weight of the original material was saved here.

FIG. 2. MINE REFUSE FROM RAVENSCROFT OPERATION OF BON AIR COAL AND IRON CORPORATION

Hand cobbled samples of pyrite were taken from these mines, so as to show the approximate percentage of sulphur in carload lots of unwashed pyrite as it would be shipped from the mines if no plant for treating the pyrite was installed. The following analyses show these results:

Carola Shaft, Bon Air, Tenn.	43.88 per cent. sulphur
Braeburn Mine, Eastland, Tenn.	46.40 per cent. sulphur
Ravenscroft Mine, Ravenscroft, Tenn.	43.72 per cent. sulphur
Clifty Mines, Clifty, Tenn.	42.72 per cent. sulphur
Fentress Coal Co., Wilder, Tenn.	45.08 per cent. sulphur
Peacock Mine, Big Mountain Coal Co., Obey City, Tenn.	40.36 per cent. sulphur
Brier Hill Collieries, Crawford, Tenn.	36.08 per cent. sulphur

The pyrite from the Fentress Coal Co. has been shipped to an acid manufacturer for some time, with satisfactory results to both the mine owners and the acid makers. The pyrite from all these mines, with the probable exception of the Brier Hill collieries, would be satisfactory for acid making after having been crushed and cleaned.

Pyrite is also found in a few of the mines in the Tracy City-Coalmont district, but not in sufficient quantities to justify saving and shipping. In the north-eastern Tennessee coal field some pyrite occurs but no detailed investigation was made of this area.

TESTS MADE AT URBANA, ILLINOIS

About Sept. 1, 1918, two shipments of crude coal pyrite were received at the laboratory of the U. S. Bureau of Mines, University of Illinois, Urbana, Ill., from the Eastland and Ravenscroft mines of the Bon Air Coal and Iron Corporation, of Bon Air, Tenn. The possibilities of utilization of coal pyrite on a large scale for the manufacture of sulphuric acid made it desirable to conduct tests on this material to learn if mechanical crushing and washing would produce a high-grade commercial pyrite free from coal and other impurities and with possibly clean coal as a byproduct. The report following gives an outline of the final tests, together with a flow-sheet outlining a possible method of mechanically treating these materials.

This lot, about 500 lb. of crude coal pyrite marked from the Eastland mine, consisted of lenses of pyrite up to 10 in. in width and 4 in. in thickness, together with considerable adhering coal. To the eye, about 50 per cent. of the lumps by volume was pyrite and the remainder was coal.

Preliminary tests showed that the clean pyrite in the

material was high grade, and that crushing to about 1-in. size would produce a clean pyrite concentrate, and consequently fairly clean coal as a byproduct. During crushing, a comparatively small amount of pyrite fines was produced, and therefore the largest sizes were the richest in pyrite. In other words, this coal pyrite, unlike the usual pyrite mineral, is stony and amorphous in structure and does not slime on crushing. This very important point made it possible to recover most of the pyrite by jigging alone, and the concentrating table was necessary only in treating the recrushed middlings. Even this product might be fed into the jig and saved as a hutch product, providing the capacity of the jig was ample.

The accompanying quantity flow-sheet (Fig. 1) shows the results of the final test run on the pyrite from the Eastland mine. Four hundred and twenty-two pounds were crushed to 3/4-in. size in a gyratory crusher followed by rolls. This was jigged in a two-compartment Harz jig with 1/4-in. screen beds. The coarse concentrates were saved as a screen-bed product and the fine concentrates were saved as a hutch product. The second screen-bed product contained some coal adhering to the pyrite and was a true middling product. It was therefore crushed through a 1/4-in. screen and treated on a Butchart concentrating table. The table cleaned this product and produced a high-grade concentrate.

The crude coal pyrite from the Ravenscroft mine was of about the same physical appearance as the material from the Eastland mine. Some of the lenses, however, were of rather light weight and had a peculiar gray color. To the eye it appeared about 75 per cent. pyrite by volume while the remainder was adhering coal. This material was tested in a preliminary way and the tests indicated that the same treatment could be used as with the material from the Eastland mine. This is a point

TABLE I. RESUME OF RUN OF EASTLAND MINE, BON AIR COAL AND IRON CORPORATION

Total, 422 lb.; 32.7 per cent. sulphur							
Product	Concentrates Analysis Sulphur,		Middlings Analysis Sulphur,		Tailings Coal Analysis,		Loss
	Weight	Per Cent.	Weight	Per Cent.	Weight	Per Cent.	
First bed concentrates.	156	43.1	..	..	..	..	..
First hutch concentrates	24	44.0	..	..	..	..	..
Second bed middlings (see table products).	..	..	..	..	..	..	..
Second hutch.	..	..	26	36.1	..	..	..
Jig tailings.	..	..	..	..	63	5.38.	..
Table concentrates.	85	41.6	..	..	..	..	..
Table middlings.	..	..	8	30.1	..	..	..
Table tailings.	..	..	..	..	19	12.38.	..
Jig loss.	..	..	..	..	..	..	34
Table loss.	..	..	..	..	..	..	7
Totals.	265	42.7	34	34.7	82	6.98.	41
						22.6A.	

Practically 265 lb. of commercial pyrite was recovered, or 62.8 per cent. of the total material treated. On further treatment, the 34 lb. of middlings could be expected to yield 25 lb. of commercial pyrite, making a total recovery of 290 lb. of pyrite or 68.7 per cent. The coal tailings were 82 lb. or 19.4 per cent. The treatment loss was 41 lb., or 9.7 per cent.

of importance, because in any concentrating plant it would allow indiscriminate mixing of the material from the various mines before treatment. On crushing, the crude pyrite produced only a small percentage of fines, and it appeared that in regular practice, crushing to 1 in. round hole size would be sufficient before attempting concentration.

The pyrite which occurs in the mines on the Monterey branch of the Tennessee Central R.R. has the same physical appearance, and it is thought could be prepared for market in a similar way to the pyrite tested.—Wilbur A. Nelson.

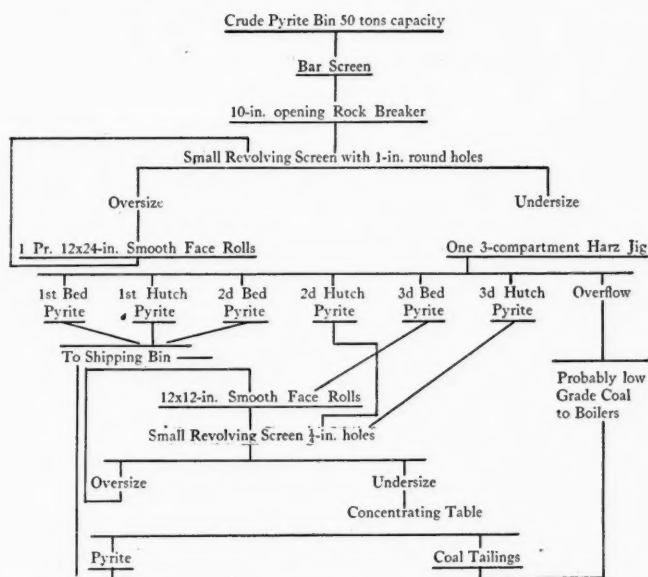


FIG. 3. FLOW SHEET OF 50-TON PYRITE CONCENTRATING PLANT FOR BON AIR-CLIFTY DISTRICT

The accompanying flow-sheet (Fig. 2) shows the final test treatment of the crude pyrite, together with the products, their quantity and analysis. The résumé sheet (Table II) shows the various products and gives an idea of what might be accomplished in percentage of recovery, etc., in a commercial plant.

The material from both the Eastland and Ravenscroft mines is high-grade pyrite with only a small percentage of attached coal. There is no technical difficulty in crushing it to about 1-in. size and, by jigging alone, to save nearly all the contained pyrite in a pure form. While the coal can be recovered in a size and purity such that it can be used as ordinary coal of screening

TABLE II. RÉSUMÉ OF TEST ON PYRITE FROM BON AIR COAL AND IRON CORPORATION, RAVENSCROFT, TENNESSEE

Weight, less sample, 790 lb.

Product	Pyrite Recovered Weight	Sulphur Analysis Per Cent.	Middlings Weight	Sulphur Analysis Per Cent.	Coal Tailings or Refuse Weight	Sulphur Analysis Per Cent.	Losses
First bed pyrite.....	214	45.2	...	...	...	...	...
First hutch pyrite.....	38	44.0	...	...	...	...	...
Second bed middlings (see table products).....	...	...	...	...	...	...	...
Second hutch middlings (see table products).....	...	...	...	...	...	...	...
Jig coal tailings.....	...	...	...	...	173	26.38. 45.3A.	...
Table pyrite.....	244	44.9	...	...	...	...	...
Table middlings.....	25	40.5	...	...	37	38.18. 52.0A.	...
Table coal tailings.....	...	...	...	...	...	...	...
Jig loss.....	...	...	...	...	...	...	57
Table loss.....	...	...	...	...	...	...	2
Totals.....	521	44.7	...	...	210	28.48. 46.5A.	59

From 790 lb. treated, 521 lb. of pyrite was recovered, analyzing 44.7 per cent. sulphur. This is a recovery of 66 per cent. The middlings were fine enough to be included in this pyrite column.

The coal tailings were 210 lb., or 26.6 per cent. of the original material. They analyzed 28.4 per cent. sulphur and 45.6 per cent. ash. This material is useless for coal on account of its high sulphur and ash content. Technically, there would be no difficulty in crushing this material finer and in extracting some of the remaining pyrite.

The treatment losses were 59 lb. or 7.4 per cent.

size, yet if most of the pyrite contained as little coal as that sent for testing, it is not commercially important to save and clean the small amount of coal produced.

The concentrating table is recommended only as an auxiliary machine to clean the middling products. For a small plant the recrushed middlings could be fed back to the jig and a concentrating table dispensed with. However, this plan lessens the capacity of the jig.

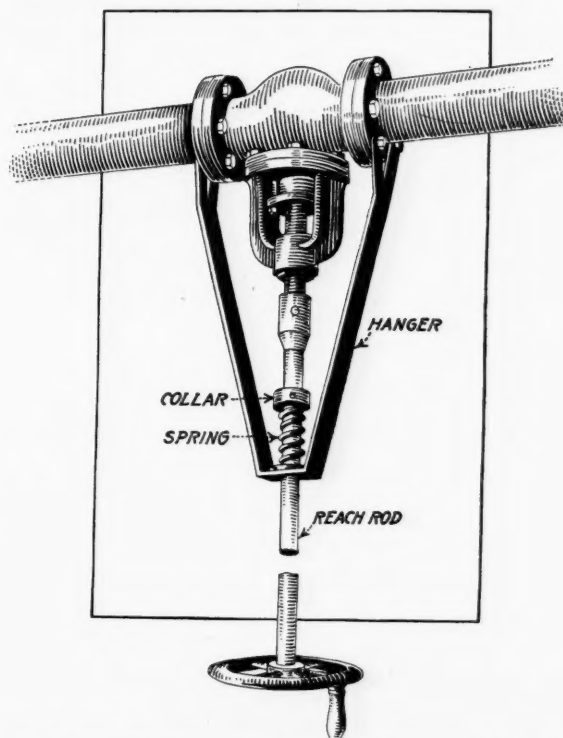
Fig. 3 is a flow-sheet of a proposed concentrating plant for the crude pyrite from these mines based on an estimated treatment capacity of 50 tons per eight-hour day. It should be remembered that on account of the low value per ton of the pyrite it is necessary to keep a treatment plant as simple as possible, and that while better recoveries might be made with a more complicated plant, yet from the test it does not seem advisable to install expensive apparatus necessary if the small sizes were to receive special treatment. Moreover, the coal pyrite slimes but little on crushing, and the small sizes are the lowest in pyrite content.

As a preliminary estimate, a plant to treat 50 tons per eight-hour day of crude pyrite should have crushing machinery consisting of a common Blake or gyratory rock crusher, followed by a pair of smooth rolls. This should be followed by a three-compartment plunger jig having compartments about 2 ft. square. Following this jig should be a pair of small rolls for recrushing the partly cleaned middling products from the jigs, and following these rolls should be a concentrating table for saving pyrite from the crushed material.

The necessary power, building, water supply and bins would probably bring the total cost of a pyrite concentrating plant up to about \$14,000 at the present time. For a 100-ton plant per eight-hour day the total cost would be about \$20,000.

Valve Reach-Rod Support

Nine out of ten reach rods that are used to operate overhead valves have either a poor bracket support or none at all, simply being pinned to the valve stem. In the accompanying illustration is shown a good way to



METHOD OF SUPPORTING VALVE REACH ROD

support valve reach rods. A suitable light-weight hanger is bolted to the valve flanges. A spring placed under a collar on the rod on this hanger, as indicated, takes the weight of the rod. A support like this prevents wear on the threads of the valve stem.

Preparation of Bituminous Coal—IV

BY ERNST PROCHASKA
Benton, Illinois

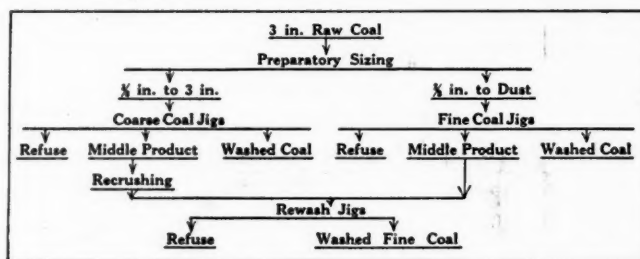
SYNOPSIS—Many types and sizes of jigs as well as washing plants have been developed. The size of jig screen, the comparative size of plunger, the length of plunger stroke, the rapidity of stroke and the thickness of jigging bed, if any, are all factors that influence the efficiency attainable in the washing of any given kind and size of coal.

BESIDES the character of the raw coal, which represents the base upon which the washing of the coal must be established, the type of the preparatory methods to be chosen must be considered. The rules for the proper selection of these methods have been given in a previous installment of this article. They are in close relation with the mechanical equipment of the jigs. According to the preparatory processes and the construction of the jigs, several main types of plant can be established. These are shown in the accompanying flow sheets.

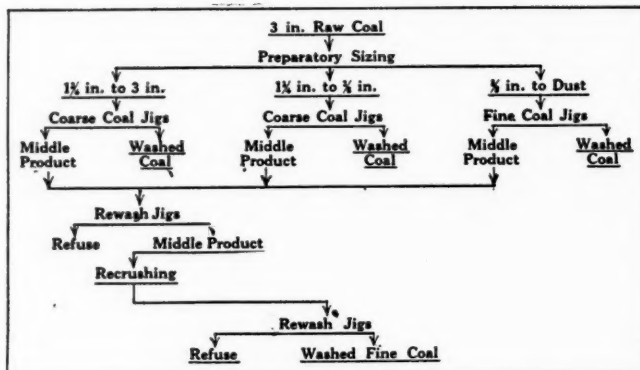
In regard to the flow sheets shown, the following remarks may be made: The system of rewashing ac-

cording to Type IV can in some instances also be used when the character of the raw coal itself does not require such rewashing. But when it is desirable to be independent of the human factor and the continuous care of the operator, especially when the washed coal must be exceedingly clean and is sold under strict specifications, the coal is washed very closely in the primary jigs and the resulting unavoidable loss of good coal in the refuse is recovered in the rewash jigs.

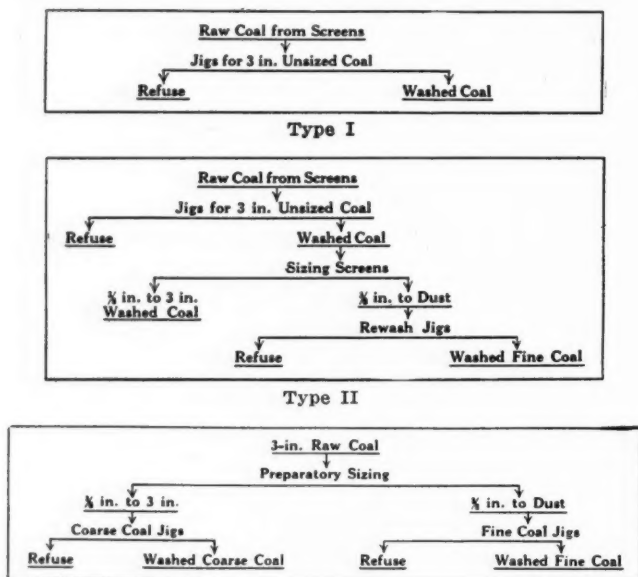
In Type VI the rewash jigs for the middle products of the primary jigs could be located ahead of the re-crushing plant. This transposition should also be considered in Type V, and its advisability will depend much



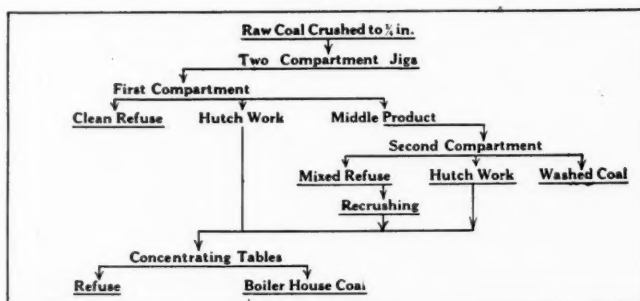
Type V



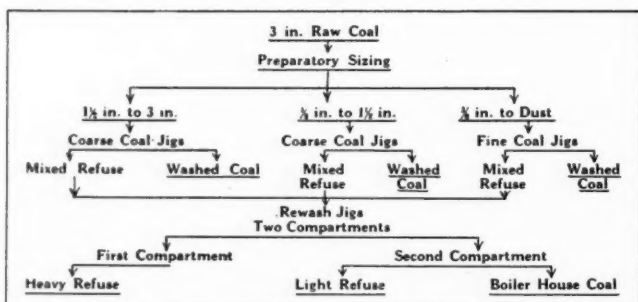
Type VI



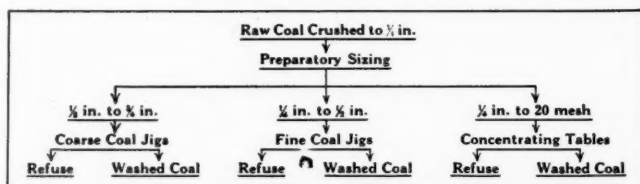
Type III



Type VII



Type IV



Type VIII

FLOW SHEETS OF SEVERAL MAIN TYPES OF PREPARATION PLANTS

Type I—Easily washed coal, impurities not disseminated. Type II—Impurities not disseminated in the coal; coarse coal easy, fine coal difficult to wash. Type III—Impurities not disseminated in the coal; coal not easily washed. Type IV—Coal difficult to wash; impurities not disseminated. Type V—Coal not easily washed; impurities partly disseminated. Type VI—Coal difficult to wash; impurities partly disseminated. Type VII—Coking coal not easy to wash; impurities not disseminated. Type VIII—Coking coal easy to wash; impurities disseminated.

upon the character of the middle product. If this contains a considerable amount of slate, picking tables can be used for the purpose of removing the heavy, pure slate, which when crushed would interfere with the proper operation of the rewash jigs. The foregoing types can be changed to suit local conditions. Only the most typical cases have been selected.

The raw coal is fed to the jigs direct from the raw coal elevator if unsized coal is to be washed; and if the coal is sized before washing, from the discharge chutes of the screens either by means of gravity chutes or in sluiceways with water. This method, however, has been largely abandoned and modern washers have in the rear and above the jigs small equalizing bins to further secure an even and uninterrupted supply of

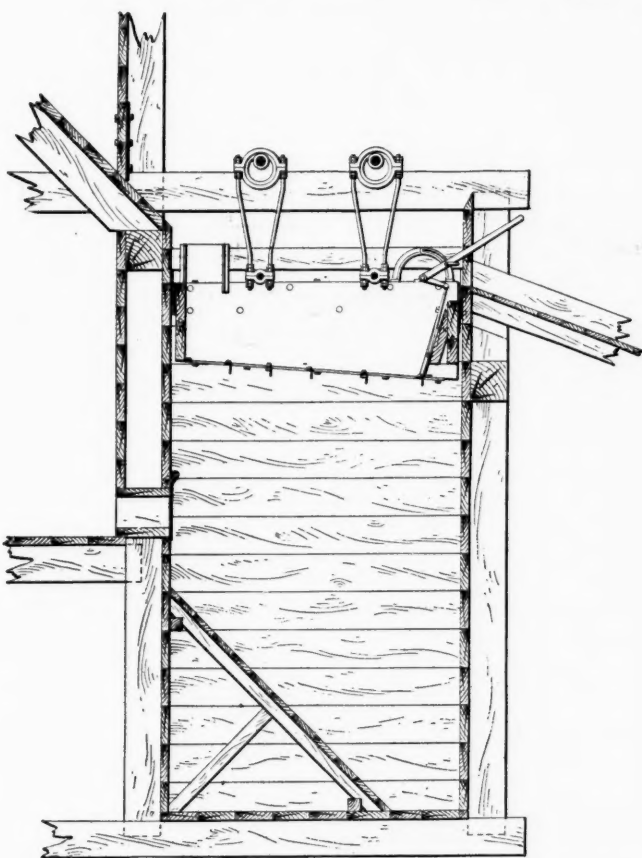


FIG. 2. STEWART JIG IN CONNECTION WITH JIG TANK

coal to the jigs. It is also advisable to feed the coal to the jigs by means of mechanically operated feeders. In most installations the flow of coal into the jigs is merely regulated by a slide gate. This, however, does not give an even feed, especially with coarse coal.

The simplest and best type of feeder is a slowly revolving drum with a slightly corrugated surface. The speed of the drum should be adjustable. This is accomplished most easily by means of a ratchet wheel and pawl, actuated from the jig eccentric shaft. Provision should be made whereby the pawl may be made to cover a greater or less number of teeth on the ratchet wheel so that the drum will revolve faster or slower as desired. Shaking or oscillating apron feeders are also in use, but these are more complicated, take up more room and cannot be adjusted with such nicety as the revolving drum feeders.

The coal from the feeders should flow into the jigs in such a way that it will be discharged below the surface of the water, so that all the coal is totally sub-

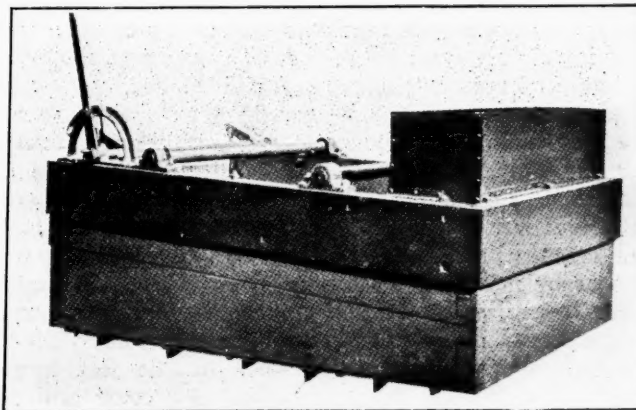


FIG. 3. SIDE VIEW OF STEWART JIG

merged. For fine and dry coal it is advisable to spray the coal before it enters the jigs, to prevent the formation of dry lumps.

It has been previously remarked that the construction of the jigs depends upon the character of the material to be washed. The jigs can be divided into three main types—coarse coal jigs, fine coal jigs, and jigs for unsized coal. According to the flow sheets, we find also jigs making only two products—that is, refuse and clean coal—and jigs making three products such as clean refuse, middle product and clean coal; or refuse, hutch work and clean coal.

Jigs can also be classified according to the means used to produce the pulsation of the water. Thus there are machines where the whole jig basket is moved up and down, and jigs with stationary screens in which the pulsation of the water is produced either by a plunger or by means of compressed air; or as in the Richard pulsator jig, by hydraulic shocks. The plungers can also be arranged differently. They may be located either in a separate compartment, which again can be placed in the rear of the jig compartment, or on one or both sides of the screens. We also have jigs with the plunger directly underneath the screen. One type of jig, with the plunger placed in a vertical position below the screen has, however, been proved a failure.

The jig screens are usually made of perforated steel plate; cast-iron grate bars are also sometimes used. The method of fastening the screen plates shows numerous variations. The methods used for refuse discharge are too numerous to mention, but they can be broadly divided into plain slide gates, either adjustable in a vertical position or swinging outward; double

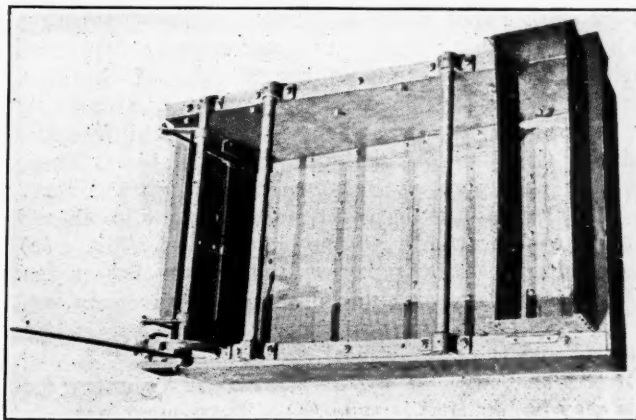


FIG. 4. TOP VIEW OF STEWART JIG, SHOWING SLATE GATE

gates, in which the lower gate regulates the height of bed and the upper gate regulates the outflow of refuse; revolving slate valves; kettles or pot valves and, finally, discharge of refuse through an artificial bed.

Furthermore, jigs can be classified as one, two or three compartment machines. If we consider that in addition to the differences mentioned in construction jigs can be built either of wood, steel plates, cast-iron plates or even of reinforced concrete, and that the plungers can be actuated by fixed or adjustable eccentrics or by means of crank-arm mechanisms, and that each single type of each group can be used without great changes in any other group, we get so many varieties that a systematic classification of the jigs into distinct types is almost impossible. By considering, however, so far as is feasible all the important differ-

constructed as two- or three-compartment jigs. (e) Jigs with one plunger between two compartments. This type is hardly ever used. (f) Jigs without plungers. The pulsation is actuated by puffs of compressed air or by hydraulic shocks.

Reciprocating Jigs or Jigs with Movable Screen—The construction of this type of jig does not show so many varieties as that of the fixed-screen type. Jigs of this type are used for unsized coal and make but two products. The only difference in the construction of the jigs is found in the arrangement of the slate gate and the methods used to diminish the suction on the upstroke. Fig. 2 shows the Stewart jig in connection with the jig tank. Fig. 3 shows the side view and Fig. 4 the top view, or rather bird's-eye view, of the jig basket. Fig. 5 shows the "American" jig. This ma-

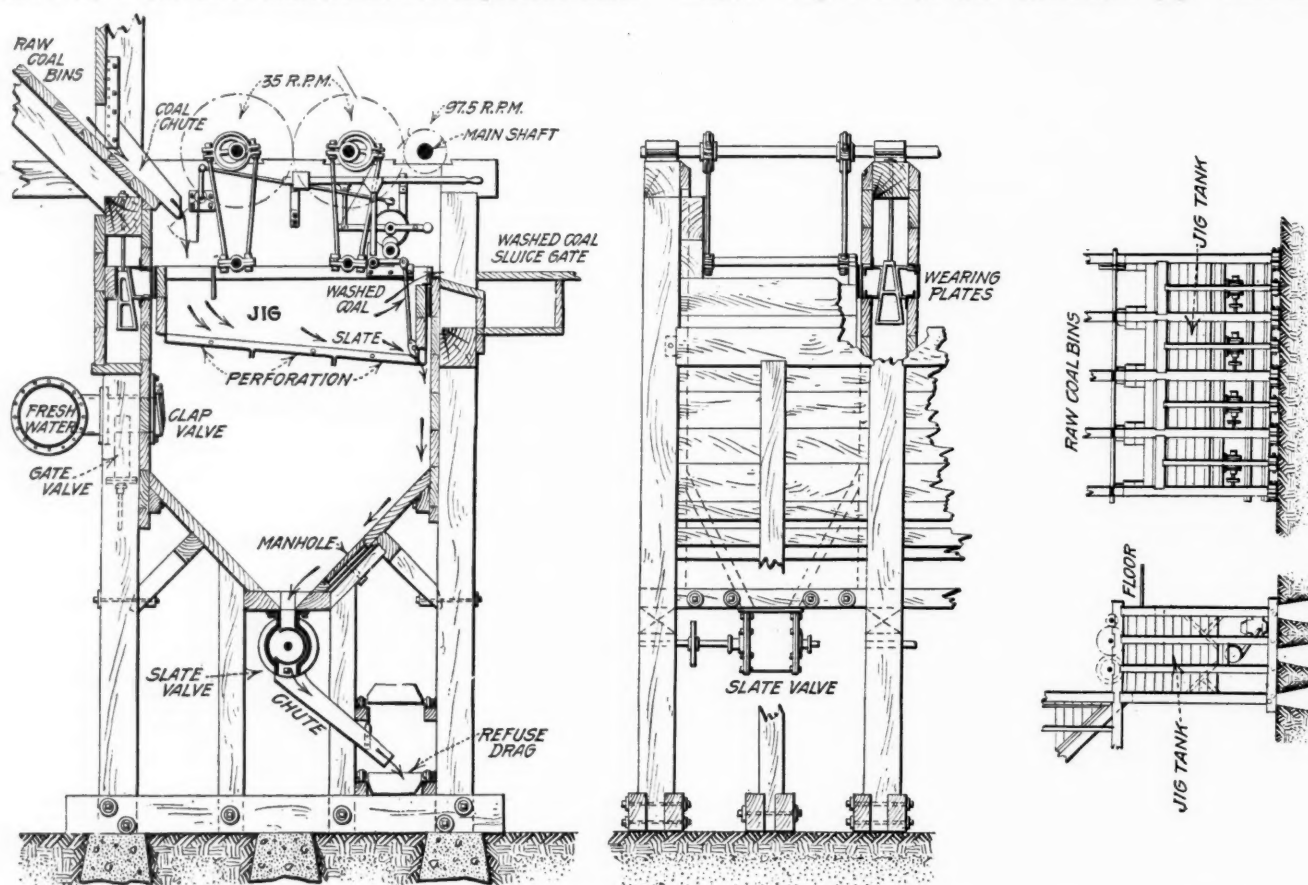


FIG. 5. SECTIONAL AND ELEVATIONAL VIEWS OF "AMERICAN" COAL JIG, SHOWING MECHANICAL DETAILS

ences, we can distinguish the following three general types:

Jigs with Fixed Screens—These include (a) coarse coal jigs, making two products only—refuse and washed coal. The plungers are in rear of the jigs, actuated either by fixed or adjustable eccentrics or by a crank-arm mechanism giving a differential motion. (b) Fine coal jigs with an artificial bed. These have the same plunger arrangement and drive as those of class (a). Refuse is withdrawn from the hutch and washed coal overflows at the front of the jig. (c) Coarse coal jigs with plungers underneath the screens. Either eccentric or crank-arm mechanisms are employed for giving the plunger motion. The refuse is discharged and the washed coal overflows. (d) Jigs with plungers on both sides of the screen. The plunger motion may be like that in type (a). These machines have either simple refuse and washed coal discharge or a third discharge for middle product. This type is chiefly

chined is provided with adjustable wearing plates on the sides, securing a water-tight joint between the jig basket and the tank. The swinging slate gate, operated by the reciprocating motion of the jig basket, is opened at intervals but always to its fullest extent, in order to prevent the accumulation and jamming of large pieces of refuse in front of the gate. The interval between successive openings of the gate can be changed at the discretion of the operator. To obtain a closer regulation of the slate discharge, the operator can easily regulate the length of time the slate gate remains open. This is accomplished by means of a sliding cam which changes the time that the slate gate remains open by infinitesimal increments.

Jigs with an Artificial Bed—This type is used only for fine coal, and the refuse is discharged through the perforations of the screen into the hutch. The difficulties of jiggling increase with the fineness of the coal. The artificial bed is used to permit the discharge

of the refuse through the screen. A refuse discharge through a slotted opening or a gate would result in either too great a loss of good coal in the refuse or too much refuse would be carried over with the washed coal. Also, the small perforations in the screen required by the fineness of the materials would clog up easily and thereby nullify the pulsations.

In order to avoid all this trouble a screen is used with perforations somewhat larger than the largest size of material to be jigged. On top of this screen an artificial bed is laid, the material of which has a greater specific gravity than the refuse. The refuse finds its way through the interstices of the bed and drops into the hutch. The best material for an artificial bed has been found to be feldspar. For the first compartment feldspar between $\frac{3}{4}$ and $1\frac{1}{4}$ in. in size,

ners too easily and must be renewed frequently. Iron is too heavy a material and kills or at least weakens the pulsation of the water.

Fine-coal jigs are often arranged in tandem, forming in reality a two-compartment jig. This arrangement exposes the material to the jiggling action during a longer period, but restricts the capacity. Fine-coal jigs show the same variations in regard to design, operating mechanism and materials used in their construction as the coarse coal jigs. Fig. 6 shows a fine-coal jig, with feldspar bed, built of timber.

On account of the novelty of the construction a description and illustration of a two-compartment jig for unsized coal will be given. This machine makes three products, and the pulsation of the water is produced by compressed air of $1\frac{1}{2}$ to 2 lb. pressure per square

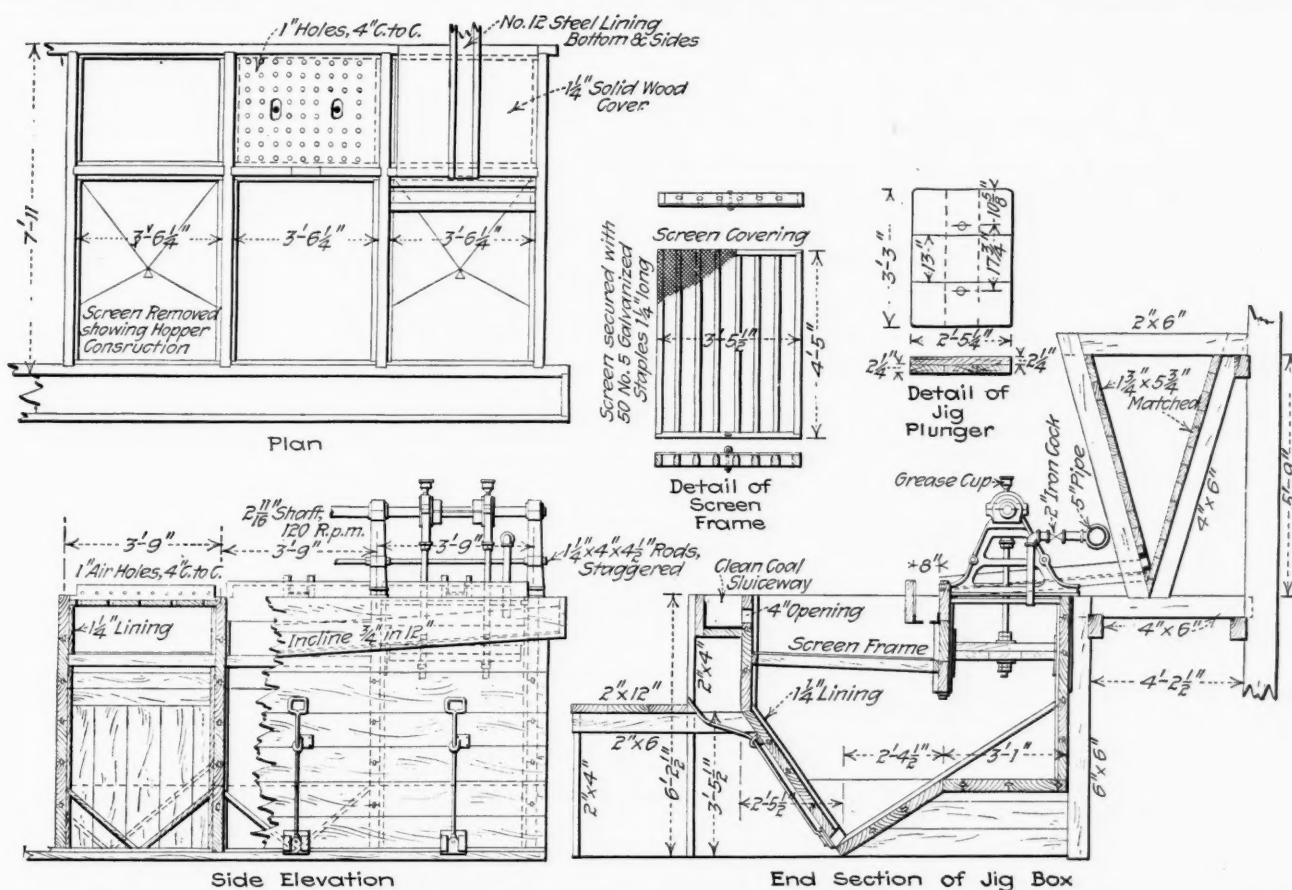


FIG. 6. DETAILS OF A FINE-COAL JIG, WITH FELDSPAR BED, BUILT OF TIMBER

and for the second compartment pieces that have passed through a $2\frac{1}{4}$ -in. and over $1\frac{1}{4}$ -in. round holes, is used. In some instances iron punchings or heavy slate have been used for a bed.

The discharge of the refuse is regulated in addition to the proper adjustment of the plunger stroke and speed, by the correct thickness of the bed and by using feldspar of a proper size. Both these values can only be determined by experiment. A deep bed consisting of small-size feldspar will give cleaner coal than a shallow bed made up of larger pieces.

Feldspar is especially well adapted for the purpose of making an artificial bed on account of its specific gravity, which lies between 2.5 and 2.6. On account of its hardness it resists abrasion, and being sharp-cornered makes a safe bed, permitting the small particles of refuse to pass through but keeping back the larger pieces of good coal. Slate being soft, wears off its sharp cor-

ner. This reduces the moving parts to simple air valves located above the rear or water compartment of the jig. The construction of the air valve is shown in Fig. 7. Here *P* is the inlet port for the compressed air. The piston valve *V* is moved up and down by the eccentric drive *c*. In the highest position of the valve, as shown in the illustration, the air in the water compartment *b* can escape through the exhaust ports *R*. In the lowest position of the valve the compressed air enters through the port *P* and expands at first to some extent on account of the increase of area; but soon the pressure in the valve will be equal to the pressure in the supply pipe. The motion of the water is reversed on the exhaust stroke of the valve. The amount of air can be regulated by the length of stroke, the intensity of the pulsation by the pressure of the air, and the frequency of the pulsations by the speed of the eccentric shaft.

The jig shown in Figs. 8 and 9 has two screens, *d* and *e*, both of which are slightly inclined against the direction of the flow of materials. The first and larger screen has three and the second or smaller one two air valves. The heavy slate is discharged immediately at the feed end of the jig through the slate gate *f* and falls through the chute *g* into the elevator *h*. This peculiar method of slate discharge prevents the disseminating of the soft and triturable refuse with the coal, and also prevents the choking up of the screen with heavy slate. On the second screen *e* the clean coal is separated and overflows at *i*. Light refuse or the middle product, according to the character of the coal, is discharged at *k* and falls through the chute *l* into the elevator pit *m*. The sludge and fine refuse which passes through the perforation of the screens is conveyed by means of a right- and left-hand screw conveyor *n1* and

For these reasons we have a multiplicity of designs and data on operation which, however, give similar final results. In any case, however, the tabulation of the most important data for each type of jigs (see the table) requires some explanation.

The methods used will change the relation between the different factors independently of the capacity, which naturally influences the size of the jig. If coal is sized before washing, a series of small jigs will be required; whereas if unsized coal is to be treated, quite frequently one large coarse-coal jig will suffice. This will explain the considerable difference in the dimensions and the capacity of the jigs. The character and the size of coal on the one hand and the type of the jig on the other strongly influence the length of the plunger stroke. The number of strokes per minute must be increased in inverse proportion, and the length

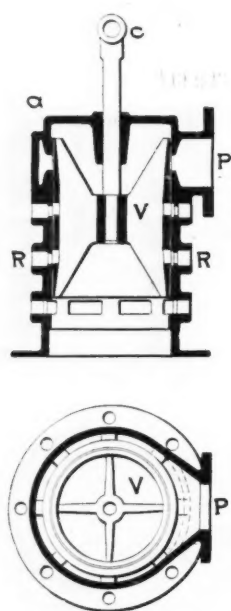


FIG. 7. CONSTRUCTION DETAILS OF AIR VALVE OF TWO-COMPARTMENT JIG

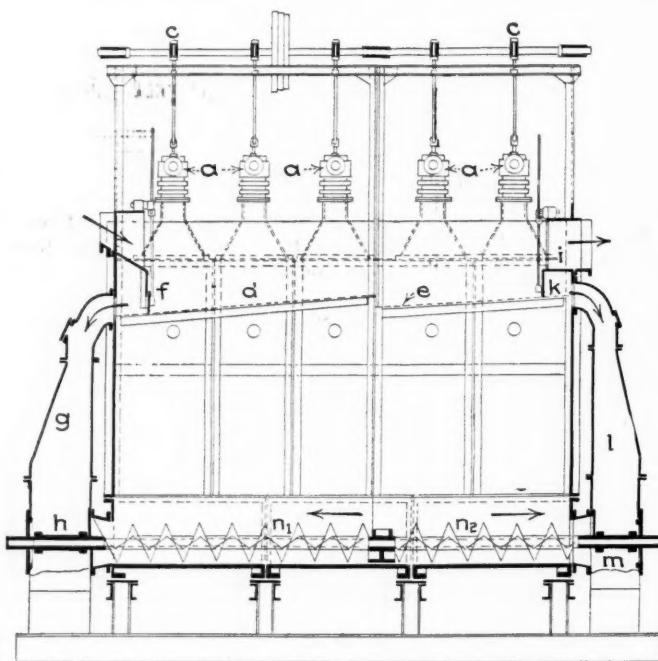


Fig. 8

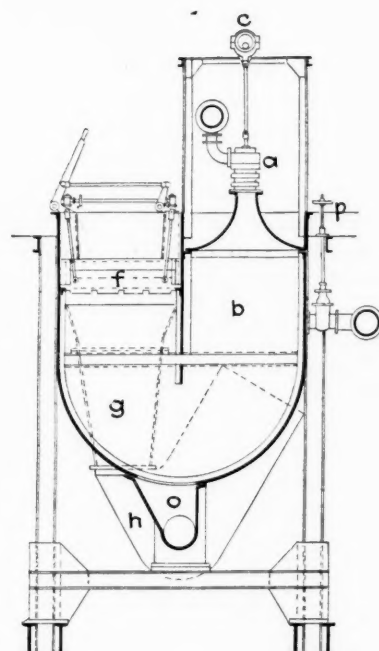


Fig. 9

FIGS. 8 AND 9. TWO-COMPARTMENT JIG FOR UNSIZED COAL

n2 to the elevator pits *h* and *m*. The water is regulated at *p*.

No fundamental difference exists between the method of operation of the jig described above and other machines. The peculiarity of the use of compressed air can be partly explained by the large size in which the jigs are built. But plunger-jigs also are built in equally large sizes for the treatment of unsized coal and are quite successful.

Owing to the great variety in the construction and arrangement of jigs, it is hardly possible to give authentic figures in regard to the work performed. This furthermore becomes more complicated, as the work and the output of a jig depend not only on the proper selection of certain dimensions such as length and width of jig screens, proportion between plunger and screen area, height of overflow above screen, and the size of perforations in the screen, but also on the proper regulation of the plunger stroke, speed of eccentric shaft, size of materials, thickness of bed, water supply and many other considerations.

The details of construction and the methods for securing a proper adjustment were developed by each builder of jigs independently and according to his own ideas.

of the stroke in direct proportion to the size of the coal. That is, coarse coal requires a slower and longer stroke than fine coal, for which a short, quick pulsation is more advisable. The size of the perforation in the screen must be smaller than the smallest size of the coal. The big difference in the power consumption can be explained by the different sizes of the jigs.

Jigs for unsized coal are mainly built for great capac-

TABLE OF THE MOST IMPORTANT JIG DATA

	Coarse Coal Jigs	Unsize Coal Jigs	Fine Coal Jigs
Width of jig screen...	24 in. to 6 ft. 6 in.	30 in. to 6 ft. 6 in.	20 in. to 7 ft. 3 in.
Length of jig screen...	3 ft. 3 in. to 16 ft.	6 ft. 6 in. to 19 ft. 6 in.	6 ft. 6 in. to 21 ft. 4 in.
Capacity per hour in tons.....	5 to 150	30 to 150	5 to 70
Capacity per square foot of screen area in tons.....	0.4 to 1.0	0.8 to 1.5	0.3 to 0.5
Number of strokes per minute.....	20 to 100	35 to 110	100 to 200
Length of stroke in inches.....	1½ to 16	1½ to 6	¾ to 2
Proportion of area of plunger to screen area.....	0.7:1 to 1:3	1:2 to 1:2.5	1:1 to 1:1.5
Size of perforations in screen in inches.....	¼ to ½ in.	5/32 to ¼	¾ to ½
Size of bed material in inches.....			9/16 to 1½
Thickness of bed in inches.....			1½ to 2
Horsepower required.....	1 to 6	3 to 7	1 to 5

ity. In some cases the whole amount of raw-coal screenings is put over one jig only, and I know of some machines treating 150 tons of raw coal per hour. The perforations in the screen are larger than in the screens of coarse-coal jigs, because a heavier pulsation is required to loosen up the unsized coal. This, however, will make the size of perforation in the screen larger than the size of the smallest particles of the material to be treated, and the refuse collecting on the screen must prevent the downward passage of the fine coal.

In addition to the foregoing considerations it is of great importance to determine the correct thickness of the artificial bed and the proper size of the material to be employed therefor. The data shown in the table can be used only as a guide. Different coals will require different beds.

(To be continued)

Coal in the Peace River District of British Columbia

BY ROBERT DUNN
Victoria, B. C.

For years the Peace River country of the Canadian Northwest has been known to sportsmen as a bear hunters' Mecca. Within recent years, however, important discoveries of coal and other minerals have been made along the upper waters of this stream and its tributaries. Sergt. C. F. W. Rockfort, of the Canadian Engineers, recently returned from three years of active service overseas, after long search some years ago was rewarded by finding the outcroppings of several coal beds on the banks of Carbon Creek. He is a firm believer in the future of this region.

The Sergeant states: There are several outcroppings showing beds totaling nearly 100 ft. These beds vary in thickness in most cases from 3 to 6 ft., while six of the beds range between 5 and 7 ft. The series culminates in a vertical bed having an exposure of 15 ft. 9 in.

Samples were taken and analyses obtained from Thomas Haynes & Son, analytical chemists of Toronto, Ont., which are reported as follows:

	No. 1	No. 2
Moisture at 110 deg. C.....	4.07	0.93
Volatile hydrocarbon.....	23.31	38.51
Fixed carbon.....	71.28	59.12
Ash.....	1.34	1.44
	100.00	100.00
B.t.u.....	13,693	15,313

It is confidently believed by the locator of this property that an improvement in quality will be proved by development, but as it stands he thinks it must be admitted that a field of fine bituminous coal, of which little is generally known, has been to an extent demonstrated. No. 2 sample indicates a high-class coking coal for smelting purposes according to the chemists entrusted with the analysis of the specimens. As no Canadian railroad is using better fuel, it is thought that the opening up of these deposits would furnish the Grand Trunk Pacific Ry. with a desirable source of supply for its western lines.

With reference to the railway situation, Sergeant Rockfort is looking forward to projected extensions of transportation facilities through the Peace River district to lead to the active development of the Carbon River coal deposits. His opinion, and that of most of the set-

tlers in that territory, is that the continuation of the Pacific Great Eastern Ry., which now traverses the province from the tidewater terminus known as Squamish, situated on the lower mainland north of the City of Vancouver, to Chasm, which is 180 miles inland and generally in a northeasterly direction, is of vital importance to British Columbia. The road has been surveyed to the town of Prince George and some further construction work on the unfinished sections is to be undertaken this summer.

But those interested in the Great Northern district are not satisfied with the present program. They want the railroad carried north from Prince George through the Peace River Pass to tap the immense area beyond. The resources of this section embrace not only thousands of square miles of uncultivated lands, but promising oil possibilities as well as coal.

Legal Department

INJURY THROUGH FALL OF SLATE—In an action for fatal injury to a miner resulting from a fall of slate in an air course, testimony of an assistant state mining inspector that the air course was too wide, that the roof was not safe unless cross-timbered, and that the mine foreman had been so advised before the accident, was properly admitted as tending to show that the operator was negligent in permitting the dangerous condition to remain in the face of actual or constructive knowledge of its existence. The injured man did not assume the risk of the accident unless the peril was so manifest to him that an ordinarily prudent man would not have encountered it. (Kentucky Court of Appeals, Lay vs. Carter Coal Co., 206 Southwestern Reporter, 769.)

ORGANIZING COAL CORPORATIONS—One who transfers to a corporation a lease of coal lands pursuant to a contract made with the promoters of the company and accepted by the corporation when organized, in consideration of a block of stock representing a one-fifth interest in the value of the mining property when equipped for production, is entitled under such contract to be treated as a subscriber for such stock, and may compel a transfer of the stock to him according to the agreement. In this case it is found that provision in the contract for a "one-fifth interest in the property fully equipped" is referable to equipment of the property with tipples, tracks, haulways, cars, and all necessary machinery and motive power to successfully operate the property. (West Virginia Supreme Court of Appeals, Wallace vs. Eclipse Pocahontas Coal Co., 98 Southeastern Reporter, 293.)

ENFORCING SALES AGENCY CONTRACTS—Plaintiff and defendant entered into an agreement whereby defendant, a coal-producing company, appointed plaintiff as its exclusive agent to market defendant's output, on condition that defendant would load first-class merchantable coal and ship same on plaintiff's orders, and that plaintiff should use his best endeavors to sell defendant's output at prevailing market prices, at a stated commission, etc. Held, that the contract was not invalid for want of mutuality as purporting to bind defendant without any reciprocal obligation on plaintiff's part. And where it appears under a contract of this kind that the producer's refusal to make deliveries would involve injury to the agent which could not be adequately compensated in damages, by reason of his inability to obtain coal of like quality elsewhere to supply his trade, a court will grant relief by injunction to restrain the producer from wrongfully breaking the agreement. (Kansas City Court of Appeals, Warren vs. Ray County Coal Co., 207 Southwestern Reporter, 883.)

Fusibility of Ash from Pennsylvania Coals*

Samples of Coal Tested Were Practically All Standard Mine Samples Gathered in Accordance with the Method Adopted by the Bureau of Mines—The Lower and Older Coals Contain More Refractory Ashes

BY W. A. SELVIG AND A. C. FIELDNER
Fuels Chemical Laboratory, U. S. Bureau of Mines,
Pittsburgh, Penn.

PREVIOUS papers¹ gave a description of the standard gas-furnace method used by the Bureau of Mines in making ash-fusibility tests, a discussion of the relation of fusibility tests to clinker formation, and complete tables giving results obtained for West Virginia and the Interior Province coals. This paper includes a table giving the results obtained for the coals of Pennsylvania, which is by far the greatest coal-producing state in the Union.

The various coal beds of the bituminous coal field of Pennsylvania are arranged according to their geological succession, the uppermost beds being listed first. Under each bed the arrangement is alphabetical according to county, town and mine. The samples tested are practically all standard mine samples collected according to the methods used by the Bureau of Mines.² A few car samples which were considered representative of the output of the various mines were also included.

The various coal districts of the anthracite region are arranged alphabetically under the field to which they belong. Under each district the arrangement is (as before) alphabetical, according to county, town and mine. The samples tested are practically all delivery samples of the various sizes as marketed, only a few standard mine samples being represented.

The number of samples from each mine, the lowest, highest and average softening temperatures in deg. F., and the per cent. ash and sulphur in the dry coal are tabulated for each mine tested. Average values for each mine were computed from the individual samples, and from these values averages representing each bed or district were obtained. In some instances the average values given for the beds or districts represent only a few mines and are in such cases not truly representative.

The point taken as the softening temperature is that at which the ash when molded into solid triangular pyramids $\frac{3}{4}$ -in. high and $\frac{1}{4}$ -in. at the side of the base, and mounted in a vertical position, has fused down to a

spherical lump. Samples remaining unfused at 3010 deg. F., which was the highest temperature attained in the test, were marked plus 3010 (+3010) and used as such in figuring the average values for the mine from which the average values of the beds or districts were computed.

As stated in a previous paper¹ on the fusibility of coal ash from the Interior Province coals, the softening temperature of coal ash from the various fields of the United States range in general from 1900 to 3100 deg. F. This range of softening temperature for convenience in discussion is subdivided into the three following groups: Class 1, refractory ashes, softening above 2600 deg. F. Class 2, ashes of medium fusibility, softening between 2200 and 2600 deg. F. Class 3, easily fusible ashes, softening below 2200 deg. F.

The softening temperature of the ash from the bituminous coal beds of Pennsylvania are found in Class 1 and Class 2, principally in the latter. The beds of the Monongahela, Conemaugh and Allegheny series, with the exception of the Lower Kittanning, Fulton and Brookville beds of the Allegheny series, are quite uniform as regards fusibility and come in Class 2. The Lower

Kittanning bed of the Allegheny series contains a large number of mines which give ash of high fusibility and the average for this bed almost places it in the lower part of Class 1. The Fulton and Brookville beds of the Allegheny series, as also the Bloss bed of the Pottsville series, come in Class 1.

It is interesting to note that the coal beds which show high softening temperatures are geologically the lower and older beds of the bituminous coal field. This was also found to be true of the coal beds of West Virginia. It has been found that in general the beds of the Monongahela and Allegheny series of Pennsylvania give a more refractory ash than do the same beds found in West Virginia.

The ash from the anthracite region of Pennsylvania is highly refractory, coming in Class 1. The softening temperature in practically every instance is above 3000 deg. F.

The tables on the pages that follow show the fusing temperatures of the ash in the coal beds of Pennsylvania and the percentages of both ash and sulphur which the coals are found to contain.

FUSIBILITY of ash is one of the coming problems of the coal industry. Manufacturers are highly interested in the subject, but as yet the mine owner has regarded it with indifference and as a problem which gives him no concern. A coal with an ash of low fusing temperature is apt to give a bad performance because the fluxing of the ash may clog the grates and prevent the passage of air.

*Published by permission of the director of the United States Bureau of Mines.

¹Selvig, W. A.: "Fusibility of Coal Ash from West Virginia Coals"; *Coal Age*, Vol. 15, No. 1, 1919, pp. 12-16.

Selvig, W. A., Ratliff, W. C., and Fieldner, A. C.: "Fusibility of Coal Ash from the Interior Province Coals"; *Coal Age*, Vol. 15, No. 16, 1919, pp. 698-703.

²Holmes, J. A.: "The Sampling of Coal in the Mine"; Technical Paper 1, Bureau of Mines, 1911, 18 pp.

TABLE OF SOFTENING TEMPERATURES OF COAL ASH FROM PENNSYLVANIA COALS

Locality, Bed, Etc.			Number of Samples from Mine	Softening Temperature, Deg. F.			Average Analysis of Dry Coal, Percentage of	
				Lowest	Highest	Average	Ash	Sulphur
1			2	3	4	5	6	7
MONONGAHELA SERIES								
Pittsburgh Bed								
County	Town	Mine						
Allegheny	Bruceton	U. S. Experimental	4	2280	2510	2400	6.82	1.23
Allegheny	Elizabeth	Patterson No. 2	2	2300	2580	2440	6.04	0.80
Allegheny	Oak Station	Oak	1			2430	6.13	1.22
Fayette	East Millsboro	Hustead	4	2110	2440	2290	8.40	1.79
Washington	Avella	Penobscott	2	2040	2110	2080	6.36	2.12
Washington	Baird	Schoenberger	6	2310	2520	2440	5.98	1.08
Washington	Finleyville	Cincinnati	3	2350	2550	2420	6.58	1.20
Washington	Greer Station	Henderson No. 1	5	2010	2200	2120	8.12	2.26
Washington	Monongahela City	Catsburg	6	2140	2610	2420	6.58	1.17
Westmoreland	Greensburg	Jamison No. 4 (car sample, lump coal)	1			2550	10.66	1.41
Average of mines in Pittsburgh Bed			34	2190	2440	2360	7.17	1.43
CONEMAUGH SERIES								
Little Pittsburgh Bed								
Somerset	Pinehill	Consolidation No. 112	2	2350	2420	2390	8.13	1.70
ALLEGHENY SERIES								
Upper Freeport (E or Lemon) Bed								
Armstrong	Ford City	Campbell	2	2000	2030	2020	17.75	5.04
Armstrong	Logansport	Raridan	2	2140	2170	2160	10.80	3.29
Beaver	Smith's Ferry	Island Run	1			2260	5.09	1.45
Bedford	Hopewell	Cambria No. 3	5	2460	3010	2670	12.43	2.01
Blair	Glen White	Glen White No. 2	4	2120	2460	2210	7.56	1.96
Butler	Butler	Muntz	1			2030	7.75	3.07
Butler	Butler	Vogele	1			2050	9.90	3.73
Butler	Butler	Cunningham	1			3000	8.67	1.26
Butler	Chicora	Country Bank	1			2110	5.55	3.71
Butler	Evans City	Victoria	2	2020	2360	2190	11.56	2.98
Butler	Jamisonville	Weamer	1			2150	8.41	1.32
Butler	Jefferson Center	Eagle	1			2220	6.50	2.67
Butler	Unionville	Cambria No. 2½	4	2410	2490	2450	8.48	1.54
Cambria	Barnesboro	Beaver Run	6	2070	2980	2380	8.49	1.81
Cambria	Beaverdale	Wilmore No. 1	5	2140	2470	2280	6.80	2.04
Cambria	Bens Creek	Wilmore No. 3	4	1990	2490	2270	7.27	2.28
Cambria	Bens Creek	Peerless No. 4	2	2270	2330	2300	10.05	1.78
Cambria	Fallen Timber	Gallitzin	5	2280	2490	2370	6.77	1.43
Cambria	Gallitzin	Sonman Slope	6	2050	2280	2170	6.44	1.78
Cambria	Sonman	Peerless No. 1	3	2420	3010	2640	8.94	0.86
Cambria	Van Ormer	Lenore No. 1	1			2500	8.49	1.02
Clearfield	Brisbin	Lenore No. 2	2	2450	2240	2220	10.70	2.94
Clearfield	Brisbin	Ernest No. 2	2	2190	2550	2490	8.58	1.28
Indiana	Ernest	Indiana No. 6	4	2410	2590	2290	7.97	2.12
Indiana	Glen Campbell	Lucerne No. 1	6	2080	2350	2240	8.28	1.98
Indiana	Homer City	Lucerne No. 3	3	2190		2300	9.98	1.74
Indiana	Homer City	West Clarion	1			2680	11.22	1.57
Jefferson	Brockwayville	Levi Berkey	1			2270	12.07	2.49
Somerset	Edie	Neva	1			2630	9.62	1.69
Somerset	Somerset	Sanner and Shaffer	1			2600	15.61	1.52
Somerset	Somerset	Ralphon No. 6	1			2450	11.90	1.99
Somerset	Zimmerman	John Dyer	1			2090	10.79	3.27
Westmoreland	Ligonier	Lucesco	4	2000	2140	2090	10.79	3.27
Westmoreland	Lucesco							
Average of mines in Upper Freeport Bed			85	2190	2470	2350	9.35	2.13
Lower Freeport (D, or Moshannon) Bed								
Armstrong	West Kittanning	Meals	2	2070	2070	2070	10.06	3.28
Armstrong	Yatesboro	Cowanahannock No. 2	2	2050	2100	2080	10.88	3.20
Cambria	Barnesboro	Cambria No. 1	5	2430	2570	2490	6.57	1.50
Cambria	Barnesboro	Delta	5	2410	2540	2490	6.70	1.52
Cambria	Beaverdale	Logan No. 6½	4	2010	2390	2250	8.49	2.73
Cambria	Hastings	Penna. No. 11	5	2430	2640	2540	7.14	1.46
Cambria	Hastings	Penna. No. 12	5	2200	2580	2380	7.63	1.86
Cambria	Spangler	Penna. No. 21	4	2240	+3010	+2350	6.49	1.32
Cambria	Spangler	Penna. No. 22	6	2530	2880	2620	6.57	1.27
Cambria	Van Ormer	Peerless No. 2	3	2330	2500	2410	10.38	2.12
Center	Clarence	Poormansite	1			2220	8.08	1.86
Center	Gillingtown	Lehigh Valley No. 15	1			2300	11.64	2.75
Clearfield	Berwindale	Reed	5	2100	2420	2200	9.36	3.47
Clearfield	Carnwath	Carnwath No. 1	5	2390	3010	2620	6.74	1.14
Clearfield	Carnwath	Carnwath No. 2	4	2140	2410	2280	7.77	2.23
Clearfield	Dubois	Eriton	1			2140	8.82	2.07
Jefferson	Brockwayville	West Clarion	1			2140	10.48	2.97
Jefferson	Punxsutawney	Eleanora	5	2120	2490	2330	7.98	2.04
Jefferson	Sykesville	Sykesville	4	2330	2720	2510	12.68	2.28
Somerset	Elklick	Eagle	1			2460	8.94	1.59
Somerset	Somerset	Stauffer No. 3	1			+3010	5.34	0.65
Average of mines in Lower Freeport Bed			70	2250	+2560	+2390	8.52	2.06
Upper Kittanning (C Prime) Bed								
Butler	Butler	Thompson	1			2230	7.33	2.09
Butler	Butler	Zenith No. 1	2	+3010	+3010	+3010	4.54	0.90
Cambria	Johnstown	Smokeless No. 1	3	2160	2260	2210	9.71	2.19
Cambria	Johnstown	Sunnyside	4	2240	2450	2340	10.40	2.47
Somerset	Confluence	Limmer	1			2190	8.44	2.42
Somerset	Holopple	Oneida	4	2120	2460	2280	11.06	2.81
Somerset	Seonor	Eureka No. 39	3	1980	2390	2190	9.20	2.24
Average of mines in Upper Kittanning Bed			18	+2300	+2510	+2350	8.67	2.16
Middle Kittanning (C) Bed								
Butler	Claytonia	Stage	1			2130	13.97	3.89
Butler	Harmony Junction	North Pgh. Realty	1			2050	11.37	4.54
Butler	Nealy	Nealy	1			1990	10.77	3.92
Clearfield	Morrisdale	Morrisdale No. 1	2	2850	+3010	+2930	8.94	1.12
Clearfield	Morrisdale	Morrisdale No. 2	2	2620	2980	2800	10.26	1.41
Average of mines in Middle Kittanning Bed			7	2740	+3000	+2380	11.06	2.98

TABLE OF SOFTENING TEMPERATURES OF COAL ASH FROM PENNSYLVANIA COALS—Continued

Locality, Bed, Etc.			Number of Samples from Mine	Softening Temperature, Deg. F.			Average Analysis of Dry Coal, Percentage of	
				Lowest	Highest	Average	Ash	Sulphur
1			2	3	4	5	6	7
ALLEGHENY SERIES—Continued								
Lower Kittanning (Miller or B) Bed								
County	Town	Mine						
Armstrong	Kittanning	Snyder	2	2090	2220	2160	10.38	4.22
Cambria	Beaverdale	Pennsylvania No. 15	5	2280	+3010	+2440	7.26	1.92
Cambria	Colver	Colver	9	2450	+3010	+2820	5.75	1.14
Cambria	Dunlo	Henriette	5	+3010	+3010	+3010	4.82	0.66
Cambria	El Mora	Peerless No. 1	5	2380	+3010	+2610	6.81	1.57
Cambria	Lilly	Sonman No. 2	3	+3010	+3010	+3010	6.36	0.67
Cambria	Llanfair	Scalp Level No. 2	4	2960	+3010	+3000	4.93	0.72
Cambria	Nanty Glo	Lincoln No. 1	12	2150	2480	2340	6.58	1.89
Cambria	Nanty Glo	Springfield No. 1	5	2080	2280	2210	6.68	2.18
Cambria	Portage	Miller No. 1 shaft	10	2260	+3010	+2730	6.22	1.15
Cambria	Portage	Puritan No. 1	4	2230	2580	2380	7.65	2.07
Cambria	St. Michael	Maryland Shaft	15	2630	+3010	+2880	6.13	0.93
Cambria	Vintondale	Vinton No. 6	3	2100	2410	2310	6.95	2.08
Cambria	Windber	Eureka No. 40	8	2520	+3010	+2650	7.38	1.22
Center	Clarence	Poormansite	1			+3010	12.83	0.91
Center	Osceola Mills	Electric	4	2370	+3010	+2680	7.96	2.07
Center	Osceola Mills	Moshannon No. 10	5	2380	2550	2470	7.52	2.11
Center	Osceola Mills	Weston	3	2450	2690	2580	7.93	2.11
Clearfield	Boardman	Potts Run No. 3	5	2530	+3010	+2850	8.95	1.44
Clearfield	Karthaus	Horseshoe	1			2440	8.97	3.23
Clearfield	Morrisdale	Morrisdale No. 1	3	2230	2320	2280	8.53	3.54
Clearfield	Morrisdale	Morrisdale No. 3	3	2500	2660	2550	7.12	1.98
Clearfield	Munson	Colorado No. 5	5	2300	3010	2600	7.87	2.08
Clearfield	Munson	Ghem	4	2300	2470	2350	9.72	3.10
Clearfield	Phillipsburg	Aeme No. 2	1			2430	7.58	2.61
Clearfield	Smoke Run	Viola	3	2600	+3010	+2750	7.75	1.10
Elk	Brandy Camp	Elbon No. 5	1			2140	8.90	2.97
Elk	Byrnedale	Byrnedale No. 31	1			2350	6.49	2.59
Elk	Dagus	Dagus	1			2240	9.95	4.04
Elk	Wilmere	Dents Run No. 1	1			2050	9.66	3.56
Huntingdon	Jacobs	Barnet	1			+3010	6.38	0.83
Indiana	Robindale	Robindale	4	2440	2490	2470	7.86	2.20
Indiana	Scott Glen	Brush Valley	6	2150	2380	2240	8.10	3.00
Jefferson	Brockwayville	West Clarion	1			2120	10.60	3.45
Somerset	Cairnbrook	Loyal Hanna No. 6	2	3010	+3010	+3010	6.75	0.86
Somerset	Holsopple	Lenore	4	2210	2600	2360	8.00	2.38
Somerset	Holsopple	Haws No. 3	6	2180	2440	2370	8.18	2.48
Somerset	Windber	Lochrie Arrow	5	2320	+3010	+2520	6.79	1.45
Sullivan	Bernice	Randall and Shad (semi-anthracite)	1			+3010	12.09	0.84
Average of mines in Lower Kittanning Bed			162	+2420	+2750	+2550	7.86	2.03
Fulton Bed								
Huntingdon	Jacobs	Jacobs	3	2770	+3010	+2880	8.64	1.63
Huntingdon	Jacobs	Starr	1			+3010	8.34	1.08
Huntingdon	Robertdale	Robertdale	5	2370	+3010	+2880	6.56	1.06
Huntingdon	Woodvale	Woodvale	3	+3010	+3010	+3010	5.92	0.95
Average of mines in Fulton Bed			12	+2720	+3010	+2940	7.36	1.18
Brookville (A) Bed								
Center	Clarence	Lehigh Valley No. 22	1			+3010	14.85	1.01
Clearfield	Karthaus	Shinola	1			2390	13.48	3.13
Somerset	Cairnbrook	Hitechew or Fleegle	1			+3010	10.60	1.43
Average of mines in Brookville Bed			3			+2800	12.98	1.86
POTTSVILLE SERIES								
Bloss Bed								
Tioga	Antrim	Annas	1			2500	12.78	2.92
Tioga	Landrus	Bear Run	1			2500	12.99	2.53
Tioga	Morris Run	New	1			2900	10.11	1.31
Average of mines in Bloss Bed			3			2630	11.96	2.25
MISCELLANEOUS								
Morgan Bed								
Tioga	Morris Run	New	1			2620	9.39	1.76
Stoner Bed								
Somerset	Pinehill	Consolidation No. 113	1			2470	11.20	1.96
PENNSYLVANIA ANTHRACITE REGION								
NORTHERN FIELD								
Pittston District								
Luzerne	Pittston	Colliery No. 14	1			+3010	6.03	0.58
Plymouth District								
Luzerne	Kingston	Gaylord (Egg)	1			+3010	12.69	0.75
Luzerne	Plymouth	Gaylord (Stove)	6	+3010	+3010	+3010	12.35	0.92
Average of mines in Plymouth District			7	+3010	+3010	+3010	12.52	0.84
Scranton District								
Lackawanna	Dunmore	Sloan	1			+3010	11.94	0.48
Lackawanna	Scranton	Marvine Collieries	2	+3010	+3010	+3010	13.99	0.80
Lackawanna	Scranton	(Chestnut)	1			+3010	12.40	0.65
Lackawanna	Scranton	(Furnace)	1			+3010	11.38	1.26
Lackawanna	Scranton	(Egg)	1			3010	14.46	0.91
Lackawanna	Taylor	Pyne (Egg)	1			+3010	10.19	0.66
Average of mines in Scranton District			7	+3010	+3010	+3010	12.39	0.79
Wilkes-Barre District								
Luzerne	Nanticoke	(Stove)	1			+3010	15.46	0.80
Luzerne	Nanticoke	(Furnace)	1			+3010	10.16	0.80
Luzerne	Nanticoke	Susquehanna Colliery (Egg)	2	3010	+3010	+3010	13.89	0.75
Average of mines in Wilkes-Barre District			4	3010	+3010	+3010	13.17	0.78

TABLE OF SOFTENING TEMPERATURES OF COAL ASH FROM PENNSYLVANIA COALS—Continued

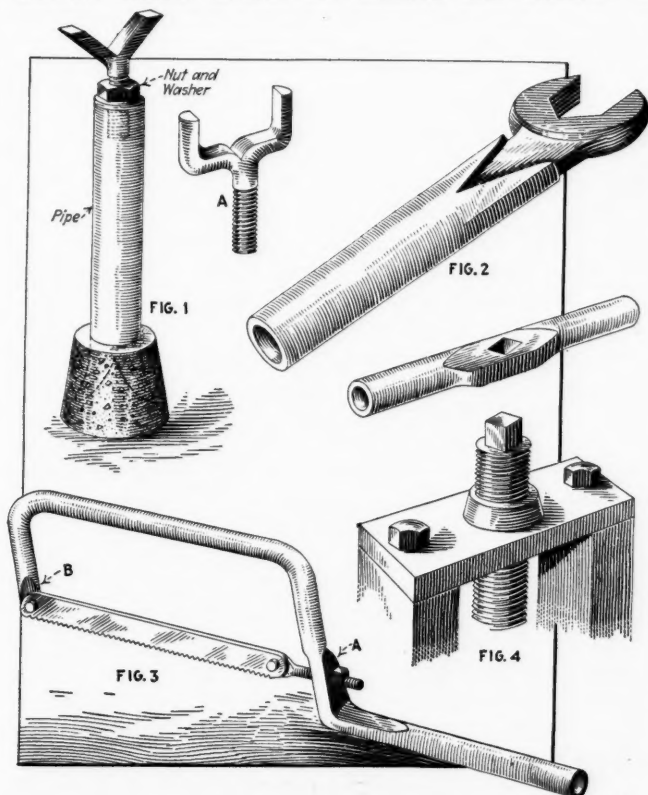
Locality, Bed, Etc.			Number of Samples from Mine	Softening Temperature, Deg. F.			Average Analysis of Dry Coal, Percentage of	
				Lowest	Highest	Average	Ash	Sulphur
1			2	3	4	5	6	7
EASTERN MIDDLE FIELD								
Hazleton District								
County	Town	Mine						
Luzerne.....	Beaver Brook.....	(Egg).....	1	....	....	2960	14.50	0.61
WESTERN-MIDDLE FIELD								
Shamokin District								
Northumberland.....	Shamokin.....	Buck Ridge (Pea).....	1	....	....	+3010	17.00	0.95
Northumberland.....	Shamokin.....	Katherine.....	1	....	....	2910	16.17	0.85
Average of mines in Shamokin District.....			2	....	....	+2960	16.59	0.90
West Mahanoy District								
Schuylkill.....	Raven Run.....	Girard Mammoth (Buckwheat No. 1).....	1	....	....	+3010	....	....
Schuylkill.....	Shenandoah.....	Hudson (Buckwheat No. 1).....	1	....	....	+3010	....	....
Schuylkill.....	Shenandoah.....	Kehley's Run (Buckwheat).....	1	....	....	+3010	....	....
Average of mines in West Mahanoy District.....			3	....	....	+3010	....	....
SOUTHERN FIELD								
East Schuylkill District								
Schuylkill.....	Darkwater.....	(Egg).....	1	....	....	3010	9.04	0.92
Schuylkill.....	St. Clair.....	St. Clair Colliery (Egg).....	1	....	....	2960	13.33	0.64
Average of mines in East Schuylkill District.....			2	....	....	2990	11.19	0.78
West Schuylkill District								
Schuylkill.....	Minersville.....	Buck Run (Buckwheat No. 1).....	1	....	....	2730	18.07	0.82

NOTE—A plus sign (+) placed before a given value denotes that the true value is above that indicated.

Handy Uses for Old Pipe

BY CHARLES H. WILEY
Concord, N. H.

An adjustable long work support (or "old woman") for holding one end of bars, shafts, pipe, etc., while working on the other end in a vise or machine can easily be made from a length of 2-in. pipe, as shown in Fig. 1. The lower end of this pipe is split and spread apart, as indicated by the dotted lines, and a base of concrete molded around the anchors thus formed. A



FIGS. 1 TO 4. SOME PRACTICAL WAYS IN WHICH TO UTILIZE OLD PIPE

satisfactory mold can be made from an old bucket by removing its bottom and setting it bottom up on a board. The adjustment of height is provided for by the use of a Y- or U-bolt and a nut and large washer. These yokes are easily made by splitting the round body of the bolt in half for a certain distance and then bending to the desired shape.

Fig. 2 shows how a useful set of skeleton wrenches can be made from short lengths of steel pipe. Select the size of pipe most suitable to the size of wrench desired. Split open one side of one end; open it out flat and cut to fit the nut. Much time can be saved by the use of such light-weight skeleton wrenches running on or off nuts that go a little too stiff to be turned with the hand.

Hacksaws are always being borrowed by somebody and lugged off. One day I made up several homemade frames such as shown in Fig. 3. They are simple to make, using $\frac{1}{2}$ -in. pipe bent to the regular frame shape and flattened at A and B, fitted with a pin and a tightening bolt, and provided with a blade. When I loan these tools it does not deprive me of my good adjustable kind.

Often the hand wheels of various valves about the run of piping become lost, and if they cannot be found I replace them with T-handles made by flattening the center of a short piece of pipe and cutting a square hole through it, as shown in Fig. 4.

Both No. 4 and No. 5 anthracite buckwheat has been used successfully in briquetting. It has decidedly passed the stage of experimentation. Briquetting with this material is a commercial success in spite of the fact that the price of No. 5 buckwheat has gone up considerably on account of the increased demand for this size fuel. When culm can be cleaned successfully on a commercial scale it has a wide field of usefulness. This size of anthracite has been burned successfully by mixing one part of culm with two parts of good coking bituminous coal. A fire of this mixture can be burned successfully with a bed of fuel 16 to 20 in. thick, using natural draft. This mixture can also be used in a stoker much the same as when burning straight bituminous fuel.

EDITORIALS

Shall the Government Loan Mechanical Equipment to Technical Schools?

THE so-called Caldwell Bill, proposing to loan the Government's surplus machine tools, especially those adapted particularly to the manufacture of munitions that are now no longer needed, to the various technical institutions throughout the country, was reintroduced in the House of Representatives on May 26. This bill was introduced in the last Congress but failed to pass. Practically the only change in the present measure from its predecessor lies in the inclusion of "scientific instruments" as well as machine tools.

Unlike much legislation proposed and enacted, this measure is short and to the point. It reads as follows:

A Bill to provide for further educational facilities by requiring the War Department to loan certain machine tools and scientific instruments not in use for Government purposes to trade and technical schools and universities, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that the Secretary of War shall lend to trade and technical schools and universities and other recognized educational institutions which in the discretion of the Secretary of War should have such equipment the machine tools and scientific instruments suitable for their use which are owned by the United States of America, which are under the control of the War Department, and which are not being used for Government purposes: Provided, however, that each institution so equipped shall be responsible to the United States of America, under regulations to be prescribed by the Secretary of War, for the proper care and safe return of such equipment when demanded, ordinary wear and tear excepted.

It is a matter of common knowledge that the advent of the struggle just past (while there was absolutely no reasonable excuse therefor) "caught us napping." Our army, of course, was small, but in addition our arsenals were not only practically bare of modern weapons but, worst of all, adequate machinery for the manufacture of arms and ammunition in sufficient quantity was lacking. It takes time to build machine tools, particularly if they are of a special design adapted to a specific purpose. Fortunately, when war was declared many factories had been equipped for making munitions for various foreign governments, particularly England and Russia. After some compromising as to design, these plants were able to turn out a product that answered the purpose, although not exactly the product to be most desired. Thus many of our troops went overseas armed with the modified Enfield rifle instead of the Springfield.

The idea of loaning to colleges and universities the Government's special instruments and machine tools for which the country now has no pressing need, we believe is a good one and worthy of strong support. If it is enacted into law not only will educational institutions receive some much-needed equipment that will serve a valuable purpose in training future engineers, but these instruments and tools will yet remain the prop-

erty of the Government and be subject to immediate call should a national necessity again arise.

We all hope that such a necessity may never come, yet we all realize its possibility. Should we then repeat the blunder of the past or would it be wiser to profit by bitter experience and be ready?

Friendship in Business

WHAT constitutes friendship in business? is a question that is more or less puzzling the selling end of the coal trade at the present moment. Does it really profit a man to play on the level with his customers in times of distress? or is it the better policy to throw all moral scruples to the winds and play the "game" for all it is worth, content in the knowledge that customers are as ready to forget a good turn as to overlook a scalping—if the latter is softened by honeyed explanations?

The time is now at hand when the conscientious coal man is hoping to reap his reward for pulling his various customers through the trying coal shortage of the past year. Still ringing in his ears are their voluble and emphatic assurances that they would remember him in the future if he but took care of them in their hour of need. And in the majority of cases the coal man did play the friend in need. But today he is questioning his judgment in so doing, and also doubting mankind in general.

Promises are not materializing, and it appears that instead of gaining his customers' confidence and good will the coal man has lost caste. There can be no denying that the coal people in the past few years have lost standing which it will be difficult to win back. If coal was sold at cost, the charge of being mercenary would still be laid at the coal man's door. In public opinion he is branded as an arch-pirate.

To what extent, then, can he rely upon the pretended or luke-warm friendship of his trade? The matter of price, on the whole, always interests the buyer most; and while the quality of the coal is also now considered with more care, nevertheless there remains a grave suspicion of the disparity in prices resulting because of this feature. The friendship of a customer in business, as it is commonly understood, is after all nothing more in substance than a card of entrée to the inner sanctum of the buyer. If it is valued at anything else, it is trying to realize on watered stock. So coal men are learning today—and bitterly, too.

Should friendship be eliminated from business? Assuredly not. Our conception should be changed, however, as to what constitutes business friendship. We have not yet learned to distinguish clearly between friendship in business and business friendship. The two terms are regarded as synonymous, and therein lies the germ of misunderstanding.

Friendship in business has already been defined: it is the card of entrée. Business friendship, on the other hand, is efficient service: a service such as the customer

will feel it unprofitable to dispense with. He will consider it as much a part of the purchase price as the actual material itself. When the customer is frankly willing to pay this premium, we have business friendship of a high order. And it is to this conception of friendship that all business must reconcile itself. The coal trade would do well to apply it more thoroughly and universally, and, perhaps, thereby earn a modicum of the public's favor.

Labor of Anthracite Mining

THE output per underground worker in the anthracite mines during 1918 was only three-quarters that of the underground workers in the bituminous mines. One would expect that the average relative price of anthracite and bituminous coal would be deducible from that proposition when the relative wage scale in the two regions was taken into account.

It is, however, not so, for the Pennsylvania anthracite regions employ $2\frac{1}{2}$ times as many men outside per ton of coal mined as the bituminous regions in the same state. This larger employment of outside workers at the hard-coal mines largely accounts for the high cost of the fuel. The careful preparation given the products is largely the cause for the disproportion of surface employees.

The average employee in the anthracite region, including both underground and surface workers, handles only two-thirds as much coal as the average employee in the bituminous region of Pennsylvania. And it must be remembered that the coal-handling costs of Pennsylvania are higher than those of many states, owing to the fact that at Pennsylvania bituminous coal mines there are many long outside hauls. The large number of coke ovens and washeries also tends to increase the number of surface workers per ton of coal mined.

Otherwise the rates in the number of outside employees per ton produced in the anthracite and the bituminous regions would be still more marked.

Coal-Mine Accidents by Nationality

THE UNITED STATES Bureau of Mines and Albert H. Fay, its statistician, are to be congratulated in securing the record of fatalities and injuries by nationalities to be found in an article in our last issue. It will be noted how low is the fatality rate of Americans. Those of us who talk glibly about the carefulness of the English miner will be somewhat surprised to see how poor is his showing. The "reckless" Irishman, like the "reckless" American, has also a splendid record in the anthracite region for avoiding fatalities second only to the Tyroleans and Hungarians, who are always admirable workers from every point of view—efficiency, safety, reliability and good citizenship. The Irishman does however, carry the honors in the bituminous region of being the "most frequent deceased" of all the English-speaking group.

The Hungarian record accords with general experience. The people of that nationality are both frugal and careful. The Greek record is consistently bad from end to end, and all records are worse in West Virginia than even in the anthracite region of Pennsylvania, the mines of which are by no means as dangerous as commonly supposed, if fatality ratios are an indication. It must be remembered that the tables cover a period dur-

ing which occurred the explosion of Layland No. 3 when 112 men were killed, and the accident at the Kempton plant of the Davis Coal and Coke Co. when 16 men lost their lives. Then followed the Barrackville explosion at Jamison No. 7 when 10 men were killed. All these explosions took place in West Virginia. Pennsylvania had during that time only the explosion at the Ernest mine of the Jefferson & Clearfield Coal and Iron Co. when 27 men lost their lives.

Accidents like these are no respectors of nationality, and being more numerous in West Virginia than in Pennsylvania, they run up the fatality record of that state. It would be interesting to know how the tables would look with catastrophic accidents of the kind mentioned excluded. Still the injury record suggests that the revision would not appreciably increase the safety status in West Virginia.

The argument in favor of increasing education among foreign mine workers advanced by the Bureau of Mines is worthy of careful consideration. An enumeration based on schedules of ability to read and write the English or other languages, and a careful tabulation of the accidents suffered by men of the different schedules, would be extremely interesting and might be well worthy of collection. We should surely know how large a proportion of our mining population is in need of elementary school training. The fatality and injury rate could easily be recorded on that basis when the educational status of all the men was once determined.

Mine Supply Accounting

THERE are undoubtedly some coal operators of the old school who look askance at the installation of any comprehensive system of accounting for mine supplies. The natural tendency is to view a matter of this kind as an expensive luxury, the results of which are not commensurate with the expenditure involved. However, no one can longer maintain such views who has looked into the matter carefully.

Modern mine accounting in general is so carefully handled in these days that a scrutiny of expenditures for supplies and consequent necessity for the adoption of a fairly adequate system of accounting in that department is made necessary for this reason if no other. In addition to this, it has been found on a number of occasions that careful accounting of supplies has checked serious cases of pilfering, waste and loss of material in other directions. For example, take the case of mine rails; where careful checks of the amounts on hand are kept, there is small probability that the mine foreman will fail to recover all his old rails as fast as the track of which it is a part has ceased to be of use. Again, an inadequate supply of rail, which might also result from poor management of the supply department, will frequently cause the men to pull up a short piece of track close to a room mouth, thus breaking the connection for bringing out the balance of the rail from the interior of the room and either discouraging the recovery thereof or making the cost excessively high, if not prohibitory.

The continued existence of the wasteful beehive coke oven, said Secretary of Commerce Redfield recently, ought to be an offense against accepted business standards, just as higher business standards, will some day think it an economic offense to allow black smoke to escape from a chimney for lack of careful firing.

THE LABOR SITUATION

EDITED BY R. DAWSON HALL

General Labor Review

If our peace with Germany loiters much longer on the road, and if in consequence our contract with the bituminous miners is much longer delayed, then the call for a short day and a short week and for other short measures (including, as is inevitable with all other things short and stubby, the short dollar) will not be necessary for everyone will be working steadily.

The short day and the short week, the short pound, the short pint and the short foot, the short dollar and short sustenance all line up together. They are all part of the same unhappy and woebegone yet well-known family of Shorts. A few years ago we regarded them as dishonest and led them somewhat resistingly to court, but now they are being openly avowed by the best industrial company. If we agree that everyone shall have a short pound or a short pint, well and good. No harm will be done. If everyone has the short day and short week, we shall be giving one another the same short measure; it will be a fair exchange. The day's work will line up gracefully with the short sack of flour and the undersized loaf, and as the mine-worker is given the short day he will, of course, not make a plaintiff sound when the baby sack or the tiny loaf is handed to him. He is a sport. If he "does" other people, it will be because he expects them to "do" him.

BARREL OF ORDERS FILLS FROM BOTTOM UP

The news from eastern Kentucky, West Virginia and Virginia is largely to the effect that coal is beginning to be sold steadily at a higher price than the Government once set. The barrel of orders is beginning to fill up and, of course, it begins to fill up from the bottom. After a while it will commence to trickle up to Illinois, and the short day and short week will be seen to be contrary to public interest and not at all necessary for the mine-worker—not even for the mine-worker in Illinois.

The labor shortage is troubling every section. In West Virginia an operator was heard lamenting the fact that Count Karolyi had been around to visit the men in his vicinity just before the United States entered the war, and that he had sold the Austrian miners a lot of Austrian bonds. Today all the Austrians in those parts, he said, were getting ready to go to Europe to see if the bonds the Count sold them were really good and negotiable.

A GENERAL EXODUS OF ALL BUT NATIVE BORN

Others are complaining that men are returning to the lands of their nativity in the hope of reuniting and supporting the broken families of their parents; still other foreigners see a chance to satisfy their hunger for the estates of the landed aristocracy. Whether the desertion will be considerable remains to be seen. Inquiries seem to point to a general exodus in West Virginia. The interesting outcome of inquiry is, however, an acknowledgment that the exodus is still in the future and has hardly begun yet.

The State Labor Commissioner of West Virginia is of the opinion that less than 500 aliens have left the state. He bases his estimate on an examination of the records of the two United States marshals in the state and upon reports from coal operators' associations and on those of the United Mine Workers. Though there are plenty to say his figures are too low, one is obsessed with the idea that when the whole condition is sized up the loss of men will not be as great as is prognosticated. That was the case when prohibition was made law in West Virginia. Mining went on more steadily than ever, yet we heard all manner of baleful predictions at the time the law came

into operation. Perhaps there is no more reason for fear of a man shortage now than there was then.

In southern Illinois it is said that nearly all the foreign population is scheming to leave. It is said that the credit of the banks is impaired owing to the foreigners withdrawing their savings. It is seriously stated that some mines have lost over a third of their force and that the demand for steamship transportation is beyond the capacity of the agents who are canvassing the field, whatever that may mean. As a matter of fact, slow work is making many foreigners and others in Illinois change their working affiliations, and even causing them to seek other employment. The loss to Europe may not be as great as the loss to more active industries and to more active plants in the same industry. In order to keep their foreign-born miners from returning home the Chicago, Wilmington & Franklin Coal Co. at its Orient mine, Orient, Franklin, Ill., has distributed the button herewith portrayed. It is in the colors of our national flag.



"ONE BIG UNION" DOES NOT APPEAL TO MINER

However much the mine-worker is attracted by the prospect of shorter time and bigger wages and more accident compensation, he does not in general favor the One Big Union. If he thinks his wages too small, he wants to get them raised even if other men suffer. With a single Big Union he would not be able to get any such adjustment. Wages would be raised all around and prices everywhere would go up accordingly, and where then would the miner be? If he is satisfied with his wage, he cannot see where the "One Big Union" can help him. He is beginning to see dimly that he is not merely the "Wage Earner"; he is also the "Wage Payer." When he quits buying business stops. The "One Big Union" of employee against employer does not appeal to him, for is he not employer and employee both—a master when he buys the product of other people's labor and a servant when he sells his own labor? If the "One Big Union" were formed he would not know where to align himself, whether as one of the selling proletariat or one of the buying bourgeoisie.

An operator said the other day that he had 35 automobiles at his mine and that the men were in a hurry to quit early to get into them. Some of the mine-workers hardly know whether they rightly belong to the proletariat or the bourgeoisie, and the "One Big Union" seems better fitted to Europe than the United States or Canada.

WOULD HAVE OPERATORS GIVE BOND FOR WAGES

A peculiar strike in a mine of the Wasson Coal Co. of Harrisburg, Ill., arises from the business failure of the Evans Coal Co. of Equality. The Evans concern contested the payment to its men of certain moneys which they claimed. On an appeal the Wasson company went on the Evans company's bond. As the filing of this bond delayed a settlement, 400 mine-workers in the employ of the Wasson Coal Co. at No. 1 mine of that concern went on strike and a tie-up of all the mines of the company is threatened.

Several operators in the coal fields of Illinois are said to have put up bonds for the payment of the wages of their men who have questioned the ability of the corporations to run the mines at such low figures as they are obtaining for their coal. At the Gus Blair mine, which is controlled by the West Virginia Coal Co., of St. Louis, the men have for some time felt that the coal was being sold at too low a figure to insure the continued payment of their wages. President Farrington of the Illinois United Mine Workers made several attempts to induce the com-

pany to put up the bond. He did not want to see the mine-workers lose their pay, as has often happened during the past six or eight years. Corporations would sell considerably below cost, and as a result fail, depriving the mine-workers of the wages that were their due.

Finally, as the West Virginia Coal Co. refused to put up bond, the mine-workers went on strike. This idleness lasted only a few days, the company giving the men the necessary assurances. The company has seven other mines and the men threatened to close these also if the desired action was not taken. There was a great deal of bitterness as it was alleged that certain other operating interests were annoyed by the "unfair" competition of the West Virginia Coal Co. and wanted the mine-workers to put an end to it by demanding either a bond or the charging of a reasonable and profitable price for the coal mined.

Reports received in Des Moines, Iowa, indicate that the mine workers in that region are looking for an increase in wage when the contract is made.

On June 2 reports from Béthune in the Department Pas de Calais were to the effect that a strike was to be called on that day. It was expected that the mines of the Anzin coal field would soon join in the suspension.

Agitators Work on the Unenlisted Foreigners

The Western Coal Operators' Association of Canada presented a memorandum to the Industrial Relations Commission (which is taking evidence throughout the Dominion of Canada with regard to the relations between employer and employee) advocating the appointment of an independent board to take control of the coal industry in western Canada. "Such a board," the memorandum states, "should, in our opinion, be made up of one man thoroughly familiar with the problems of the operators; one man familiar with the problems of the workmen; and a third with such qualifications and experience as would commend him to all as a reliable chairman. The industry has reached a point where, although permission is granted to sell coal at a given figure, it is impossible to do so on account of competition from other fields, chiefly American."

Discussion and consideration of the position of the coal industry occupied practically the whole time of the Commission on the afternoon of Saturday, May 3, and the operators appeared to be one in the opinion that joint councils of the employers and employed could not bring harmony to the industry at the present time because most of the miners—85 per cent. of them according to a Drumheller operator—were foreigners whose ignorance made them a prey to agitators. It might be different were the proportion of English-speaking miners large, but that was not so and was not to be looked for, as most of such men had enlisted and many of those returning were not fit to go back to their former work. The Board of Control which the operators recommended, it was thought, should have the same power as was given W. H. Armstrong, the wartime director of coal operations in District 18, as established by the U. M. W. of A. (Eastern British Columbia and the Province of Alberta).

W. F. McNeill, secretary of the operators' association; John Shanks, manager of the Brazeau collieries; Jesse Gouge, operator; and W. S. Henderson, operator of Drumheller, represented the organization indicated.

Mr. McNeill stated that two mines were on strike against the order issued by the director of coal operations, but he admitted that the strikes were unauthorized by the union officials. Discussing housing conditions, witness said there were no complaints from the permanent camps, but only from new camps where bunk houses had to be used.

The markets of the British Columbia mines were in Montana and Washington, and those of the Alberta mines were in Alberta, Manitoba and Saskatchewan. Freight rates hampered the operators in competing in Manitoba with Pennsylvania anthracite.

John Shanks, manager of the Brazeau collieries, described in detail the arrangements made between his company and its employees. The collieries are situated 120 miles west of Red Deer and six miles from the nearest village. The gov-

ernment leases land to the miners through the company, which has erected four-room houses at a cost of about \$900 and rented them to the employees at \$10 a month. Five-room houses are rented at \$15 a month. A subsidiary company runs a store in the mining village. The desire for better working conditions is one of the primary causes of that discontent which has become acute since the war began in 1914. "Blanket men," who brought their own blankets and slept in bunkhouses, are no longer content with such meager conditions. A hospital charge of \$2 a month is made to each man, and for this a doctor has been engaged. He pays a nurse and the staff of the institution.

Men in the mines, said the witness, are not disposed to neglect their work or be dilatory on the job, but it is fair to say that they have become very independent. The "labor turnover" is large, because many young men are employed, and when they have earned a considerable sum they go away to the cities and towns.

Two operators from Drumheller gave evidence, John Henry Gouge and W. S. Henderson. Mr. Gouge declared that the cost of getting out coal was \$2.53 for labor alone, exclusive of the cost of management and overhead charges. He did not think that any operator would be opposed to joint councils, but they would be unworkable because the employees, mostly foreigners, would not cooperate with them.

Mr. Henderson said that he employs when working 150 men, but that he had practically shut down his mine since Apr. 1. The price of coal was high, he said, because wages had been boosted to such a level as was unfair to the operator, to the general public and to the miners themselves. He testified that "If coal can be marketed at \$1 a ton less, we can compete in Manitoba with the hard coal" [from the United States].

Mr. Anderson stated that there were 22 mines in the Drumheller district, each of which had its own small system of lighting and its own water supply. This duplication of effort is expensive business, and Mr. Henderson suggested that the government should take over the mines, install a central lighting and central water system, and thus cheapen the cost of running the mines. Enough slack coal, not worth shipping, was wasted in the vicinity of the mines to supply fuel for a power station for the operation of all of them. Attempts to run the mines amicably had been made, but "foreign-born agitators had upset the whole thing by Bolshevik talk."

E. Mart, general manager of the Canadian Coal Co. collieries, the first witness at the meeting on Monday (May 5) said that calculations showed that the advance in wages in mining had more than compensated for the increased cost of living. He spoke feelingly about agitators who felt no responsibility like an ordinary British subject, yet earned from \$10 to \$20 a day. These agitators, he declared, were the chief causes of the undue discontent.

Illinois no Longer Pays Union Dues

The severe industrial depression, which has decreased the running hours of the Illinois coal mines to less than half of full time and has closed down many of the mines altogether, is given as the reason for the abandonment of dues and assessments by the United Mine Workers in the Illinois District. Frank Farrington, president of that district, announced recently that the 85,000 members of that state would be relieved of the obligation to pay dues for at least three months and perhaps longer.

May Not Use Boys on West Virginia Tips

Under a ruling of the Commissioner of Internal Revenue received by the State Labor Commissioner of West Virginia, no boys can be employed in or around coal mines. The State Labor Commissioner had put the question to the Revenue Commissioner as to the employment of boys on tipples. The commission replied that such employment was forbidden and that any company which employed boys in violation of the ruling would be called upon to pay as a penalty an amount equal to ten per cent. of the annual net income of the company.

DISCUSSION BY READERS

EDITED BY JAMES T. BEARD

Certification and Safety

Letter No. 6—I can endorse much that has been said by J. M. Roddie, in his letter, *Coal Age*, Apr. 17, p. 723, regarding the examination of candidates for positions of responsibility, in coal mines. If my memory serves me right, the Coal Mines Regulation Act of Great Britain requires that the examining board shall be composed of three operators, three local men appointed by the Government, and, further, that the applicant must have five years' practical experience in mines or have been under the supervision of a mining engineer for three years¹.

It was in England that I obtained my first certificate to act as mine manager. It was the practice then that a young man of 20 years of age, of wealthy parents, could be apprenticed to a mining engineer or general manager for a period of three years and would then be eligible to take charge of mining operations.

The young man would be taken into the mine every day by the mine boss or overman, who would generally be pestered to death with his stupid questions, and this would continue for the three years of the young fellow's apprenticeship. During the same time, the lad would attend mining classes every Saturday. At the examination, which was regularly held once a year, such a candidate was seldom refused a certificate, after which he was generally pushed into a good job.

THE PRACTICAL MINER AND THE STUDENT BOSS

On the other hand, the practical, experienced miner, who managed by hard study to pass the examination and get his certificate was rarely ever given a position higher than under-manager or foreman and made responsible for getting out the coal. The student boss would come into the mine for a short time each morning, find some fault and go on top again. Such were the conditions regarding certification in England at that time.

In this State (Indiana) the examining board is composed of chief and deputy mine inspectors, appointed by the governor. From what we read of appointments under politics, in this and other states, leads one to fear that many members of examining boards have not had the practical experience in coal mining that would qualify them to pass the examination given by their own board.

This statement, of course, does not apply to all examining boards; but it teaches the lesson that politics should have no bearing or influence in matters pertaining to the safe management and inspection of our mines.

¹At present, the Coal Mines Regulation Act of Great Britain (1911) provides that the Secretary of State shall form an examining board for mining examinations, which shall be constituted as follows: Six representatives of owners or agents of mines, or managers of mines, or mining engineers; six representatives of workmen employed in mines; the chief inspector and two divisional inspectors of mines; two persons eminent in mining and scientific knowledge. The act further provides that the candidate must be at least 23 years of age and have had practical experience, in mining, of not less than five years, a portion of which must be in mines of the United Kingdom. But an applicant holding a diploma or having an approved degree, is required to have but three years of practical mining experience.

Coal mining is a dangerous occupation at the best. It is a business that should be supervised by careful and experienced men who are fully qualified for that work.

Speaking of the influence of politics in mining appointments, a friend of mine, whom I know was fully qualified to sit on any board, applied for the position of examiner. A little later, however, the vacancy was filled by the appointment of another who, though less qualified, had a stronger political pull.

In his letter, Mr. Roddie suggests that a mine foreman candidate should have an experience of nine years in practical mine work. Let me say that, while some men would learn a lot of mining in that time, others would require three times nine years to qualify them for the position of mine foreman. Mr. Roddie regards it as a mystery that mine inspectors do not take more part in discussion; but my observation is that it is the fear of the loss of their position that deters them from giving expression to their views.

Linton, Ind.

MINE FOREMAN.

The Burrell Gas Detector

Letter No. 1—Some two or three years ago, I remember there was a full description given in *Coal Age* of a new instrument that was devised by George A. Burrell for the detection of gas in mines (Vol. 9, p. 157). In that article, I believe the claim was made that the instrument was ten times as sensitive as an ordinary safety lamp.

Since that time, I have had excellent opportunities for making a large number of practical tests with this instrument in the mine and, at the same time, taking samples of the air tested and submitting them to careful chemical analysis. The results show a remarkable accuracy in the practical tests made in the mine with the instrument, and I take pleasure in submitting the following table of the tests made, 149 in all, which I trust will prove of interest to the readers of *Coal Age*.

Many of these tests were made by myself personally, and I have no hesitancy in saying that the detector gives good results when carefully handled. Particularly, in making a test where the percentage of gas is so small as to be liable to escape detection with the most sensitive safety lamp in use, the results obtained with the Burrell detector are extremely gratifying.

IMPROVEMENT MADE IN THE ORIGINAL CONSTRUCTION INCREASES ACCURACY OF TEST

It should be known that the original construction of the detector has been slightly altered, recently. A letter received a short time ago, from J. T. Ryan, vice president and general manager of the Mine Safety Appliances Co., Pittsburgh, Penn., the sole manufacturers of this instrument, states that the alterations were made for the purpose of taking better care of the changes in temperature that result from the ignition of the methane when that gas is present within the instrument. Mr. Ryan says, "The essential difference in the con-

struction of the new type detector is that, instead of having a single brass tube, it now has two concentric tubes, the outer one having about a half-inch larger diameter, and the space between the tubes being filled with Keiselgor, an insulating material."

Following are the results of the practical and chemical tests to which I have previously referred:

COMPARATIVE TESTS TAKEN WITH BURRELL GAS DETECTOR AND CHEMICAL ANALYSIS IN THE CROW'S NEST DISTRICT

Sample No.	Chemical Analysis	Burrell Detector	Sample No.	Chemical Analysis	Burrell Detector
158	0.45	0.4	304	1.54	1.0
168	0.47	0.6	317	1.35	1.0
192	0.64	0.8	172	1.38	1.5
193	0.57	0.7	185	1.55	1.8
162	1.92	1.5	200	1.40	1.5
176	1.26	1.5	240	1.21	1.1
180	2.10	2.2	280	1.21	1.2
205	1.69	1.5	306	1.34	1.0
234	1.95	1.6	160	0.43	0.2
290	2.28	2.0	166	0.30	0.3
321	2.44	2.0	202	0.49	0.4
373	1.11	0.9	278	0.72	1.0
381	1.19	1.3	294	0.72	0.5
442	1.05	1.0	308	0.44	0.3
443	0.89	0.7	165	1.15	0.9
289	1.93	1.5	191	0.57	1.1
320	1.78	1.3	201	0.75	0.5
161	1.00	1.3	279	0.96	1.2
179	1.78	1.6	309	1.24	1.0
204	1.46	1.2	203	0.69	0.4
233	1.67	1.2	277	0.66	0.7
153	2.54	2.2	295	0.72	1.1
183	2.17	2.5	307	0.68	0.6
198	2.30	2.6	296	0.76	0.8
241	2.55	2.2	311	1.23	1.0
287	1.94	2.0	370	1.20	0.9
301	1.82	2.2	297	0.57	0.3
313	2.34	2.5	312	0.61	0.6
364	1.61	1.6	298	0.99	0.9
377	1.62	1.6	343	1.62	1.5
169	0.79	0.8	352	1.43	1.3
182	1.23	1.9	409	0.99	1.3
197	1.47	1.5	423	0.68	0.5
242	1.68	1.4	432	0.80	0.5
302	1.53	1.4	433	0.75	0.5
314	1.46	2.0	434	0.69	0.5
340	0.93	1.0	151	1.01	0.9
387	1.28	1.1	152	1.48	1.2
163	1.28	0.7	153	2.54	2.2
184	1.26	1.6	159	1.20	1.0
199	1.38	1.5	177	0.73	0.8
243	1.16	1.0	169	1.78	2.0
303	1.27	1.1	193	1.67	1.4
588	1.09	1.0	135	0.99	1.4
389	1.78	2.2	170	1.34	1.4
174	1.08	1.3	181	0.95	1.2
196	1.88	1.7	194	0.81	1.1
238	1.59	1.6	168	0.85	0.5
282	1.67	1.2	172	0.85	1.3
305	1.46	1.2	178	0.74	0.6
318	1.65	1.5	192	0.85	0.5
173	2.52	2.5	127	1.01	1.4
239	1.38	1.5	136	0.96	1.5
281	1.44	1.2	143	1.18	1.5
			161	1.11	1.0
			171	1.13	0.7
			182	1.20	1.1
			211	1.01	0.7
			123	0.13	0.3
			147	0.18	0.1
			...	0.98	0.94

Average of 54 samples..... 1.52
Average of 60 samples..... 1.4

VANCOUVER ISLAND

Sample No.	Chemical Analysis	Burrell Detector	Sample No.	Chemical Analysis	Burrell Detector
117	0.29	0.4	156	1.76	1.9
89	0.41	0.5	179	2.27	2.1
113	0.34	0.3	183	2.16	2.2
142	0.35	0.7	184	2.18	2.0
95	0.76	0.8	185	2.12	1.7
112	0.83	0.8	186	0.17	0.2
143	0.83	0.9	192	0.78	0.6
98	0.34	0.4	100	0.75	0.4
114	0.35	0.3	125	0.93	0.5
145	0.33	0.3	157	1.07	1.0
101	1.63	1.3	180	1.88	1.6
127	1.50	1.4	128	0.79	0.5
158	1.49	1.7	159	0.88	1.0
126	1.34	1.5	182	1.18	1.2
188	1.81	1.9	108	0.29	0.2
189	0.34	0.2	129	0.29	0.3
99	1.83	1.7	131	0.13	0.3
124	1.59	1.6			

Average of 35 samples—1.02 0.98
Totals average of 149 check samples taken during 1918—Chemical analysis 1.17%; Burrell gas detector, 1.10%.

The Burrell gas detector is now being used by all the mine inspectors in this province, and is also provided by the coal companies operating in the province, for their officials to search for percentages of gas lower than can be detected with the ordinary safety lamp.

GEORGE WILKINSON,
Victoria, B. C., Canada. Chief Inspector of Mines.

Efficiency of Mine Workers

Letter No. 1—Much has been said in the columns of *Coal Age* about the efficiency of mine officials, foremen and firebosses; but long and close observation has convinced me that not enough attention is being paid to the efficiency of the "prime producer," who, I would say, was the miner or the general worker employed in the mine.

The average coal-mining man will agree with me that no matter how efficient a foreman may be, he cannot get results unless he has some efficient workers at the coal face. The foreman may be an excellent manager and able to direct the work, but that will not take the place of the work that must be performed by the men who break down and load the coal.

It is quite true that the output of a mine depends on many different things and, perhaps, the most important of these is a good foreman. This is true, today, more than ever before, because of the increasing exhaustion of the high coal and the extended development of our mines, together with the varied equipment now employed in large up-to-date mines. It is clear that it will require greater efficiency in the miner to produce his shift of coal when working a 2½ or 3-ft. seam than where the coal runs from 8 to 12 ft. in thickness.

NEED OF TRAINING MINERS TO BE EFFICIENT WORKERS

It is these conditions that lead me to believe that more attention must be paid to the efficiency of mine workers, particularly the miners. They must be trained, by every possible means, to become better workers, for their own good and that of the industry. There will then result a noticeable increase in the production of coal and a proportionate decrease in the number of mine accidents. In the past, coal-mining companies have confined their efforts, in securing greater efficiency, too much to the colliery officials and neglected the importance of training the workers and developing in them an equal efficiency.

In respect to wages, it is true that in every mine there are those who make high wages and others who make very low wages. For some time past I have been studying the payroll of contract miners and find that, while some miners have produced from 60 to 70 cars of coal in two weeks, others working in the same seam and under the same conditions produced but one-half or two-thirds of that amount. This fact reveals a low standard of efficiency and argues for the need of training our miners.

The question will be asked, How is this to be done? Looking at the situation and comparing the daily production of six, eight and ten cars of coal by some miners, with the four, five and six cars produced by others, under the same conditions; and, considering the complaints made by these latter men that the coal was "hard to cut," "worked poorly," or some similar excuse, one is convinced that there is something radically wrong with the men themselves. Either they have not the same knowledge of the structure of the coal, or they fail to use their judgment, or they are less industrious than their fellows who are better producers and more efficient workers.

This comparison of results suggests the remedy to apply to secure greater uniformity in the work of the miners, by striving to make them all equally efficient with the best workers. It would seem that a good plan

to adopt would be to single out the best workers and make each of these instruct about a dozen of the poorer class. The results should appear in the increased production effected in a month. To my mind, this matter is of sufficient importance to warrant the making of a reasonable trial.

Another feature that should be considered, in this connection, is the waste of mine supplies, on the part of inefficient workers. More timber, tracking and other material will be required by the inefficient worker, for the same production of coal. Take, for instance, two company miners employed on dead work, the one being efficient and the other wasteful. It will often be surprising to note the difference in the cost of powder, dynamite, spikes, tracking, and tools furnished these men on the company account. Here, again, the need of training the less efficient worker in the proper methods to employ is plainly evident.

INEFFICIENCY OF WORKERS CAUSES ACCIDENTS

Lastly, the frequency of mine accidents, owing to the inefficiency of workers, is a factor demanding the same careful consideration. Practically all coal companies are doing everything in their power to reduce the number of accidents in their mines, but few realize that the lack of training inefficient workers is a most prolific cause of accidents and loss resulting therefrom. Close observation shows that the majority of mine accidents result from the violation of some rule or regulation, by a careless, indifferent or ignorant worker.

While it is true that accidents will happen, it is equally true that many mine accidents can be avoided, by the careful training of all mine workers and by greater discipline in the mine. One of the best means of educating and training men, in respect to what is required to insure their own safety and that of their fellow workers, is to get the men together for the purpose of discussing questions relating to their work and the dangers to be encountered.

Many of the larger companies hold such meetings monthly or semimonthly and it goes without saying that the good accomplished thereby has been far reaching and effectual in reducing the number of accidents in the mines of those companies. To vary the monotony and make the meeting more attractive, the regular business is preceded by a little entertainment, by local talent. This always puts the men in good humor and opens the way for a more animated and general discussion of the topics that are presented later.

JOSEPH R. THOMAS, Asst. Foreman,
Plymouth, Penn. Colliery No. 3, Hudson Coal Co.

Letter No. 2—It was pleasing to read the foreword in the issue of *Coal Age*, Apr. 24, entitled "Meeting the Situation." It is just such temperate discussion of the trials that miners are going through, at the present time, that will aid largely in the solution of labor troubles following the war.

As a miner, or rather a mine examiner, I could not help but feel that I would like to have voiced a protest, at the reference made to the suggestion of a 6-hr. day for coal miners, which appeared in *Coal Age*, Apr. 3, p. 629. After all that has been said in regard to the efficiency of mine officials, I feel that it would only be justice to the common miner to consider the question of developing greater efficiency in the work that he performs as his share in the industry.

When I think of the many wrongs imposed on the miner, in the operation of our coal mines, it makes me think that the claim of the Kaiser that "Might makes right," is prevailing to a great extent in the management of our large coal corporations. It does not require a volume of statistics to reveal the great waste of energy in the production of coal, to say nothing of the sacrifice of thousands of lives of mine workers.

LONG HOURS IN THE MINE INCREASES ACCIDENTS

Many of us whose lives are spent, day after day, in the dark recesses of the mine, realize the destruction of manpower through the senseless system enforced by the coal companies, in keeping their men underground longer than is required to meet the demand for coal. No man can be an efficient worker and continue as such under these conditions. Also, there is no question but that there is greater liability to accident caused by prolonging the hours of mine labor beyond what is required for the performance of the necessary work to meet the demand for coal.

Formerly, it was the agreement between miners and operators that eight hours should constitute a working day, and the miner was required to be at work at the coal face that length of time. In many instances, the miner must travel long distances, a mile or more, to reach his place, after entering the mine. This means both an increase of labor and loss of time to the miner, keeping him from home and underground ten or even twelve hours of the day.

SHORTER HOURS MEAN GREATER EFFICIENCY

The miners' viewpoint is that greater efficiency would result from a shorter working day. The suggestion is not prompted by selfish motives; it is logical and reasonable when one considers present conditions and has in mind the attainment of the highest efficiency in the worker. Today, there is a certain amount of coal needed in the country and for export. It is estimated that this coal can be produced in half the present contract time.

Someone will suggest that this is an outgrowth of Bolshevism, but it is not; it is only common sense. Speaking of the spread of Bolshevism to this country, coal operators are alone to blame for the large proportion of this low-class of the foreign element now employed in our mines. When the fortunes of war were imperilled, it was the firm, loyal attitude of our American miners that withstood the attempt of this foreign element to tie up the coal industry of the country. It was rare to find an American miner, who was in sympathy with the strike movement demanded by that element, whose cry was "Throw down your tools and end the war," to which our miners replied, "Pick up your tools and win the war."

Having won the war through their fidelity and loyalty, the American miner wants an American living. He is convinced that the present order of things is wrong, and the conditions prevailing at the mines today support him in his conclusion. Since the armistice was signed, there has been no work worth mentioning at the mines, or that would afford an industrious miner the living he is able to earn. Notwithstanding this, our miners have been patient, thanks to the true-blues among them, and the determination grows that in the future "AMERICANISM" must be the watchword if we are to develop the highest efficiency in mine workers.

Staunton, Ill.

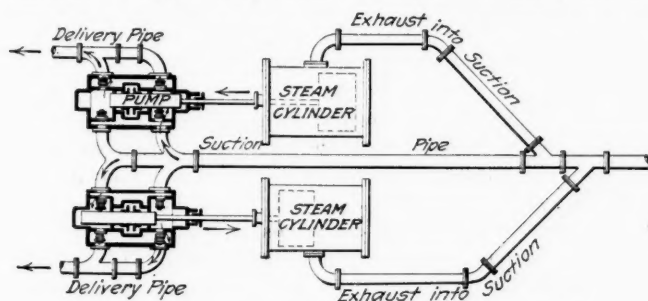
W. M. CHAMBERS.

Exhaust from Steam Pump

Letter No. 7—In connection with the proper disposal of the exhaust steam from a mine pump, I am submitting herewith a sketch or diagram of the plan of a duplex, double-acting, plunger pump, having the exhaust port of each steam cylinder connected with the suction line of the pump.

The length of the suction line was only 18 ft. and the pipe was most of the time submerged in the water of the sump, which greatly reduced the head under which the pump operated. Only when the water in the sump was low was there any trouble. At such times, the pump would knock a little, which was a warning that it was time to shut off the steam and stop pumping.

The arrangement shown in the sketch gave good results. I agree fully with the editor in the point he



PLAN OF DOUBLE-ACTING, DUPLEX PUMP

makes that, should the exhaust connection enter the suction pipe at the top of a long suction lift, there would probably result a back pressure and possibly water-hammer, owing to the steam not being quickly condensed by immediate contact with the water as it enters the pipe.

In another arrangement, adopted at another mine, I conducted the exhaust steam from the pump into a tank that was always kept full of cold water. This was supplied from the rising main or column pipe, a 1-in. pipe being used to conduct the water from the main to the tank. The flow of water into the tank was regulated by opening or closing a valve in this connection.

In a short suction lift where the suction pipe is kept full of water during the operation of the pump, the exhaust should be conducted into the suction pipe as close to the pump as convenient, unless the plan is adopted of using a cold water tank such as I have just mentioned. In my opinion, the exhaust from a mine pump should never be connected with the column pipe, as that would have a tendency to interfere with the uniform discharge of the pump to the surface and oppose its regular action and would probably cause a water-hammer that would not only be harmful but very annoying.

WM. DICKINSON, SR.

Oak Hill, W. Va.

Letter No. 8—In connection with the discussion of the question of disposing of the exhaust steam from a pump in a mine, allow me to cite an instance where this was done to great advantage, in a mine of which I had charge.

The pump, in that case, was located at the foot of a 32-ft. shaft and drew its water from a sump 600 ft. back in the mine, although the total suction head was only 12 ft. Previous to the time of which I speak, the pump had exhausted its steam into the air shaft. How-

ever, the development of the mine now required the installation of a ventilating fan at the top of the shaft; and, because the men were unable to work over the shaft when the pump was in operation, it became necessary to make some arrangements for disposing of the exhaust steam.

To do this, I resorted to the scheme of turning the exhaust into the suction pipe of the pump. For that purpose, we tapped the suction line at a distance of 70 ft. from the pump, making the connection between that point and the pump by means of a pipe of the same size as the exhaust port of the steam cylinder. A tee was inserted in this pipe near the pump and provided with two globe valves, one on each side. By closing one of the valves, the other being open, it was possible to exhaust either into the atmosphere or through the pipe into the suction line, as desired.

The scheme worked well. When starting the pump and until it had caught the water and filled the suction pipe, the two globe valves just mentioned were arranged so that the exhaust steam was discharged into the atmosphere. But, as soon as the suction pipe was full of water and the pump was operating properly, these valves were changed. One was opened and the other closed as nearly as possible at the same time, so as to avoid drawing any air into the suction line. The pump now exhausted into the suction and the result was that its speed increased from eight to ten strokes a minute, which was a considerable gain in the quantity of water discharged, per pound of steam used to operate the pump.

Not only did this arrangement get rid of the annoyance of the exhaust steam in the shaft but the pump worked quietly, and there was no water-hammer such as had proved a great annoyance in its previous operation. Turning the exhaust steam into the suction pipe produced a cushioning effect on the piston before the steam was wholly condensed. Also, the partial vacuum produced in the suction lift, owing to the condensation of the steam in that pipe, effected a considerable saving in the power required for pumping.

Referring to the suggestion of exhausting the steam into the column pipe into which the pump discharges its water, let me say that such an arrangement would be very unsatisfactory, and I question whether it would work at all. There would certainly result a back pressure when the pump was compelled to work against its own exhaust, to say nothing of the back pressure due to the water column, which would be very much greater and would seriously interfere with the working of the pump. Let me advise that this should never be done.

Meadowland, Penn.

D. F. M.

Letter No. 9—The question of exhausting steam into the suction pipe of a mine pump, as discussed in *Coal Age*, has led me to make some interesting figures for the purpose of ascertaining how much the steam exhausted, in any given case, would raise the temperature of the water pumped. My figures appear to show that the rise in the temperature of the water would not ordinarily be sufficient to interfere seriously with the pumping.

Assume, for example, that a pump is lifting water from a sump 12 ft. in depth and is located, say 2 ft. above the surface of the water, making the total suction lift 14 ft. Suppose, further, that this pump is discharging under a total head of 70 ft., including friction.

A head of 70 ft. corresponds to a water-end pressure of $70 \times 0.434 =$ say 30 lb. per sq.in. and, assuming an available steam pressure of 120 lb. gage, at the throttle of the pump, the ratio of the area of the steam end to that of the water end of the pump is $120:30 = 4:1$. This means that for every cubic foot of water pumped, there will be required 4 cu.ft. of steam.

CALCULATING THE RISE IN TEMPERATURE DUE TO HEAT IN THE EXHAUST STEAM

At sea level, a gage pressure of 120 lb. corresponds to an absolute pressure of 135 lb., practically. At this pressure, a pound of steam contains 1191.5 B.t.u. and has a volume of 3.35 cu.ft. Therefore, for every cubic foot of water raised, there will be required, in this case, 4 cu.ft.; or, $4 \div 3.35 = 1.194$ lb. of steam. The heat in this steam is $1.194 \times 1191.5 = 1422.6$ B.t.u. and this is, therefore, the heat required to be absorbed by each cubic foot of the water pumped. Now, taking the weight of a cubic foot of water as 62.4 lb., the heat required to be absorbed, per pound of water pumped, is $1422.6 \div 62.4 = 22.8$ B.t.u. This calculation shows that the temperature of the water will be raised 22.8, or say 23 deg. F., since 1 B.t.u. is the quantity of heat required to raise the temperature of 1 lb. of water 1 degree of the Fahrenheit scale.

Therefore, assuming the original temperature of the water in the sump is, say 60 deg., its final temperature in the pump and the column pipe would not much exceed 83 deg. under the assumed conditions. It appears to me that these figures are suggestive of the advantage to be gained by condensing the exhaust steam in the suction pipe of a pump.

To carry the calculation a step further, we may ascertain the temperature at which vapor would form under the pressure due to the suction head. In this case, we find an absolute pressure of $14.7 - (14 \times 0.434) = 8.6$ lb. per sq.in. Reference to steam tables shows that steam or water vapor, at this absolute pressure, has a temperature of 186 deg. F. Therefore, condensation of the exhaust steam will continue in the suction pipe, in the case assumed, where the temperature cannot exceed 83 deg. F.

FREDERICK L. SERVISS, SR.

Golden, Colo.

Living Conditions at Mines

Letter No. 5—No one who has lived much of his time in mining camps can fail to read with interest the letters that have been written thus far emphasizing the need of good living conditions in mining towns and particularly in camps, which are often neglected.

The coal-mining industry is in a class by itself, in respect to the living conditions surrounding its workers. Unlike a factory, a coal mine must of necessity be located where the coal is to be found. This is often in an isolated place far from any railroad other than a branch track laid to the mine.

ISOLATION OF MINE AN IMPORTANT CONSIDERATION

The isolation of the mine makes it all the more important that the operator or company should provide, not only means of transportation to and from near-by towns or villages, which would enable their employees to go and come as occasion may require, but the company should build good houses for its men and start a little town of its own at or near the mine.

In most of these isolated camps, there is no means of reaching the outside world, except to go and come on a coal train that has no regular schedule, but is liable to run at any time. Frequently, an old stage is used to convey passengers back and forth over roads deep in mud, which makes traveling slow and tedious.

It is clear that such conditions as these, at a coal mine, makes it difficult to hold men, except the poorest class of workers. No miner who has a family or has children to educate would consider for a moment living in such a place, especially if there are no schools, churches and other privileges at hand. I recall an instance that occurred some years ago when I was working at a mine in West Virginia where the conditions were much as I have just described, the mine being located at a considerable distance from any town or village.

It happened that, owing to slack work at the mines in the Middle West, a number of miners came to West Virginia from that locality and applied for work at our mine. The men were good coal miners, but they stayed only a short time and left to seek work elsewhere. In answer to my inquiry as to why they wanted to leave, one of them said that he had had to lose a whole day each week in order to get a shave.

POOR CONDITIONS KEEP GOOD WORKERS AWAY

It can well be imagined that a small place where there was no barber would not afford many other conveniences of life, and it will cause no surprise to learn that such was the case in this place. A coal train was the only means of transportation to the nearest town. It carried an old caboose and had no regular schedule for running. On the whole, there was nothing about the place to invite good workers or to hold the men already employed there.

At another mine, in the same state, conditions underground were ideal; but living conditions, on the surface, were poor indeed. It was not uncommon for 25 or 50 men to leave the place every payday and not return for a week or ten days. The mine was equipped with the most up-to-date machinery and appliances, but the company had yet to learn that good conditions in the mine are not all that is required to get a good class of workers and to hold them. As a result, breakdowns were frequent and the cost for machine repairs was high, because the men did not know how to run and care for the machines in their charge.

It is a mistake to think that higher wages will hold men in a camp where the living conditions are poor and there are no amusements and other privileges. We have much yet to learn in this direction when we fail to realize that the improvement of living conditions, at mines, is a profitable investment.

In the excellent foreword that appeared in *Coal Age*, Apr. 24, entitled "Meeting the Situation," it is stated "if the war has taught nothing more than that money is not the universal cure for all labor troubles, it has done some real good." The foreword emphasizes the fact that what the laboring man most desires is to give his own home folks a recognized position in society and make life worth living. The boys coming home from the war will seek work where they can enjoy the highest privileges and any company that does not realize this fact will experience a scarcity of labor, for there will be no oversupply of mine workers for some time to come.

Cleaton, Ky.

OSTEL BULLOCK.

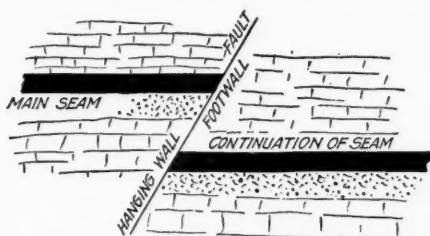
INQUIRIES OF GENERAL INTEREST

ANSWERED BY JAMES T. BEARD

"Hanging Wall" in Mining

Please explain the meaning of "hanging wall?"
Shamokin, Penn. STUDENT.

The expression "hanging wall," as used in mining, refers to the upper portion, geologically, of a slip or fault of dislocation. Where the strata are regular, or have not been folded, the hanging wall is above the



SHOWING A FAULT OF DISLOCATION

fault line, as shown in the accompanying figure; but if the strata have been folded, as occurs at times even in the coal formations, the hanging wall may be below the fault line. The opposite wall is the "footwall."

Meaning and Determination of "Candlepower" in Lighting

When estimating the intensity of light, in comparing the illuminating power of different sources of light, the value is always given in "candlepower." It is a common expression and, yet, I believe few understand its real meaning or, in other words, know what determines the candlepower of a lamp, in actual practice. In searching for the meaning of this expression, I have been unable to find a satisfactory explanation.

Also, kindly explain the means and method employed for determining the candlepower of any source of light, such as a mine lamp, an electric bulb or other means of lighting.

CURIOUS.

Salt Lake City, Utah.

A full explanation of the term "candlepower," as expressing the intensity of any light, is given in the treatment of the "Photometry of Safety Lamps," p. 290, *Mine Gases and Explosions*. In the pages following (291, 292) will also be found the method employed to determine the candlepower of any source of light.

A candlepower is a unit of measure adopted arbitrarily to express the value of the illuminating power of different lamps when burning different illuminants. This unit of measure is the intensity of light produced by the burning of a well-trimmed sperm candle (6's), weighing six candles to the pound. The so-called "standard candle" is of such proportion that its flame will consume exactly 120 grains of spermaceti in an hour, when burning in a quiet atmosphere of pure air.

As is well known, candles are made of different materials, such as paraffin, stearin, tallow, wax and

spermaceti. The last-named material, having the greatest illuminating power except extra-refined paraffin, has been chosen as the standard of candlepower.

Taking the illuminating power of a standard sperm candle as unity or 1, the candlepower of different materials is as follows: Paraffin, 0.76; stearin, 0.77; tallow, 0.83; wax, 0.92; spermaceti, 1.00; extra-refined paraffin, 1.14. The degree of refinement of the paraffin, however, being somewhat uncertain, spermaceti has been taken as the standard of candlepower. The quality of pure spermaceti being constant, the standard sperm candle burns with a uniform intensity of light and furnishes a good standard of measurement for determining the illuminating power of different sources of light.

In ascertaining the candlepower of any given source of light, as for example, a common Davy safety lamp, burning sperm, lard or cottonseed oil, it must be remembered that the intensity of light from any source varies inversely as the square of the distance at which it is measured. For example, taking the light of a standard sperm candle, measured at a unit distance (1 in. or 1 ft.) from the candle, as unity or 1, its intensity at a distance of two units is $(\frac{1}{2})^2 = \frac{1}{4}$. The same is true in regard to the intensity of any source of light to be tested.

Now, in order to apply this principle in the comparison of the illuminating power of a Davy lamp with that of a standard sperm candle, these two sources of light are placed on opposite sides of a screen. The screen consists of a sheet of white paper, having a spot the size of a half-dollar at the center, made translucent, with a little grease or melted wax. When this screen is lighted equally on both sides, the translucent spot at the center disappears.

Utilizing this fact, the sources of light, the sperm candle and the lamp to be tested, are arranged on opposite sides of the screen. Suppose, for example, the distance of the standard candle from the screen is ten inches, the inch being taken as the unit of measurement, the intensity of light thrown on the screen by the candle being inversely proportional to the square of the distance is $(\frac{1}{10})^2$, or $\frac{1}{100}$, the candlepower of the candle being 1.

In like manner, according to the same principle, the candlepower of the lamp tested, assuming that at a distance of 4 in. it gives equal illumination of the screen with the candle, is $(\frac{x}{4})^2$, or $\frac{x}{16}$.

Then, since the illumination of the screen by the lamp at a distance of 4 in., is equal to that due to the standard candle at a distance of 10 in., we have

$$\frac{x}{16} = \frac{1}{100}; \text{ and } x = \frac{16}{100} = 0.16 \text{ candlepower}$$

Therefore, the candlepower of a Davy lamp burning sperm oil, as determined in this manner, is 0.16 candlepower. In other words, the light given out by one hundred of such lamps would be equal to that given out by sixteen standard sperm candles.

EXAMINATION QUESTIONS

EDITED BY JAMES T. BEARD

British Columbia Examination First Class, Nov. 20, 1918

(Selected Questions)

Ques.—In an air-course 6 x 8 ft. in section and 5500 ft. long, what is the velocity of the air current when the water gage stands at 2 inches?

Ans.—A water gage of 2 in. corresponds to a pressure of $2 \times 5.2 = 10.4$ lb. per sq.ft. The sectional area of the airway being $6 \times 8 = 48$ sq.ft., and its perimeter, $2(6 + 8) = 28$ ft., the velocity of the air circulated in this airway by the given pressure is

$$v = \sqrt{\frac{p a}{k l o}} = \sqrt{\frac{10.4 \times 48}{0.00000002 \times 5500 \times 28}} = 402.6 \text{ ft. per min.}$$

Ques.—(a) Explain the principle of the ventilating fan. (b) What conditions in the mine would govern you in determining the diameter and width of the fan?

Ans.—(a) The action of all centrifugal ventilators depends on the centrifugal force developed by the revolution of the air contained within the fan blades. The weight of the revolved air develops a force acting radially outward from the center of the fan, which forces the air from the center toward the circumference, where it is discharged into the annular space surrounding the fan blades and passes into the fan chimney, if the fan is exhausting the air from the mine; or is conducted into the fan drift and thence into the mine when the fan is forcing the air or acting as a blower.

(b) Every mine has a certain resisting power, depending on the length and size of its airways and number of splits and which is expressed by the ratio of its area of passage to the rubbing surface. This ratio is properly the potential factor of the mine, as it determines the possible circulation in that mine, produced by a given pressure or power.

The calculation of the proper dimensions of a fan required to circulate a given quantity of air against a given mine potential is a problem for the engineer. Briefly, it may be said that the diameter of the fan or the diameter of the circle described by the blade tips is a factor of the unit pressure required to circulate the given quantity of air against a given mine potential. Roughly speaking, a certain peripheral speed or velocity of the blade tips is required to produce this given pressure, which enables a fairly close estimation of the diameter of the fan.

On the other hand, the width of the fan is largely a factor of the quantity of air required to be circulated. For example, in average mining practice, the width of a centrifugal fan, having radial blades with lips curved forward in the direction of motion to lessen the shock of the entering air, may be taken as $1/64$ of the square root of the quantity of air required. Thus, the width of a fan designed to circulate 150,000 cu.ft. of air per min., in ordinary mining practice, is approximately $1/64 \sqrt{150,000} = \text{say } 6 \text{ feet.}$

Ques.—(a) If, in an airway 72 sq.ft. in sectional area, the velocity is 550 ft. per min., what will be the velocity if the area is decreased to 60 sq.ft.? (b) What is the horsepower in each case, if the water gage is 1.9 inch?

Ans.—(a) This question is indefinite, being incomplete. For the same quantity of air in circulation, the velocity would vary inversely as the area. The area being reduced in the ratio $60/72$, or $5/6$, the velocity would be increased in the ratio $6/5$; and would then be $6/5 (550) = 660$ ft. per min. However, this would not conform with the condition of a constant water gage (1.9 inch).

It is reasonable to suppose that the reduction of area took place through the settlement of the roof. It may be assumed that the original airway was 6 x 12 ft.; sectional area, 72 sq.ft. The settlement of the roof reduced the height of the entry to 5 ft., giving a sectional area of $5 \times 12 = 60$ sq.ft. Now, for a constant water gage, the length of the airway remaining unchanged, the velocity varies directly as the square root of the area and inversely as the square root of the perimeter; or directly as the potential factor, $\sqrt{a/o}$. Finding the potential factor in each case, we have

$$\begin{aligned} \text{Airway } 6 \times 12, \quad \sqrt{a/o} &= \sqrt{72/36} = \sqrt{2} = 1.414 \\ \text{Airway } 5 \times 12, \quad &= \sqrt{60/34} = \sqrt{1.7647} = 1.328 \end{aligned}$$

But, since the velocity varies directly as the potential factor, the velocity ratio is equal to the potential ratio, and calling the required velocity x , we have

$$\frac{x}{550} = \frac{1.328}{1.414} = 0.939$$

$$x = 0.939 \times 550 = 516.5 \text{ ft. per min.}$$

which shows that the velocity is decreased when the sectional area is decreased in the airway, the pressure being maintained constant.

(b) The quantity of air passing in the original airway is $72 \times 550 = 39,600$ cu. ft. per min. The water gage being 1.9 in., the horsepower producing circulation is

$$H = \frac{Q p}{33,000} = \frac{39,600 \times 5.2 \times 1.9}{33,000} = 11.86 \text{ hp.}$$

Again, the quantity of air passing under the same gage when the sectional area has been reduced to 60 sq.ft., is $60 \times 516.5 = 30,990$ cu.ft. per min. The horsepower required for this circulation is, therefore,

$$H = \frac{30,990 \times 9.88}{33,000} = 9.28 \text{ hp.}$$

Ques.—What system of haulage would you install in a dry and dusty mine? Give reasons fully.

Ans.—If the mine plant is equipped to furnish compressed air for haulage motors, no better system can be adopted, in a dry and dusty mine, than a compressed-air system, because the air exhausted by the motors will assist the ventilation. If compressed air is not available some form of rope haulage should be employed. Electric haulage should never be considered in such a mine, because of the danger of ignition of dust by sparking of wires, especially if a little gas is present.

COAL AND COKE NEWS

Harrisburg, Penn.

A bill is scheduled to pass the state Senate and be sent to Governor William C. Sproul for signature. It is claimed that this bill will drive 10 of the largest insurance companies of the country from the field of Pennsylvania as regards workmen's compensation and result in monopolistic state insurance, notwithstanding the fact that these companies combined to take care of workmen's compensation in the coal fields. Because of its technical nature, the bill went through the House without opposition, few, if any of the members understanding it. Little opposition to it is expected in the Senate.

The bill was introduced by Representative Hess and carries amendments to the act of June 2, 1915, which create a rating bureau to be approved by the insurance commissioner and absolutely under his control, this bureau to fix all rates for compensation insurance. The bill is said to have been drawn and presented in the interests of the mutual insurance companies of the state.

The mutual companies are said to expect to reap great advantages in the insurance field through the elimination of the stock companies, also expecting to cripple the state insurance funds. Commissioner Donaldson of the State Insurance Department is reported to have said that if this bill passes it will eliminate the 10 per cent. differential rates now enjoyed by the state fund. The state fund was granted authority to sell insurance at 10 per cent. less than other companies with a view of building it up. The Hess bill therefore might result in placing the state fund on a straight competitive basis with other companies.

Friends of the state fund, among them being some of the large coal companies, are supporting the Hess bill. They see that by means of this bill the state fund eventually will hold the compensation field to itself. This will mean monopolistic state insurance in this particular field and no doubt in time will spread to other lines of insurance.

A few days ago the Legislature passed and sent to Governor Sproul a bill designating what resources shall be set aside by companies for protection of holders of policies for workmen's compensation insurance. This bill allows mutual companies to set aside less reserves than stock companies, notwithstanding that mutuals have no assets.

On June 4, the Senate passed the McConnell bill granting authority to the insurance commissioner to ascertain whether rates made by insurance companies, individual associations or rate making bureaus are excessive or adequate and to determine "reasonable" rates in such cases. This would place insurance companies under direct control of the commissioner.

Senator Albert Davis of Scranton, on June 2, introduced a bill aimed at mine cave conditions in the anthracite field. The main provision of the new bill makes it unlawful for coal companies to damage cemeteries or disturb graves by mining operations.

Fairmont, W. Va.

The best indication of improving conditions in northern West Virginia sections was seen during the week ended May 31 in the decreased number of idle mines as well as in the increased number of cars loaded. In the Fairmont region proper there was an increase over the previous week, the total number of cars loaded being close to 5000 for the week. In April the total number of loads was only about 14,000 in all. A large factor in increasing shipments from northern West Virginia regions has been and was (during the last of May) the heavy tonnage for export; although it was apparent that more coal was being bought in all markets, judging from the increased western movement of coal. Decoration day, of course, tended to cut down the volume of coal mined and shipped during the week. Lake ton-

nage was somewhat increased. Cars were also more plentiful. No serious labor shortage has developed in the region. Prices are much firmer and further increases are expected in that respect.

Sentiment of the operators of northern West Virginia as to the resumption of cost sheets to be submitted to the Federal Trade Commission is being sounded out by Vice President George T. Bell, of the Northern West Virginia Operators' Association. This is a matter which will also come before the West Virginia Coal Association.

Charleston, W. Va.

With a larger production in West Virginia mines there has also developed in several producing regions of the state a car shortage most pronounced during the last week of May and in the first few days of June, interfering with the prompt shipment of coal particularly to tidewater and in some instances causing a shutdown of two days. Such a car shortage came just at a time when regions were striking their gait in response to a quickened demand confined to no particular section or market. Consumers in general had begun to realize the necessity of buying coal now; consequently further increases in tonnage from all regions was not confined to exports nor to railroad coal, but to all kinds of fuel, coke alone failing to move in any considerable quantity. In nearly every producing district mines were being operated throughout the week. The pressure of a demand from exporting sources made itself felt during the last few days of May and at the outset of June, more ships being available. The demand for West Virginia coal in the West, and particularly on the Lakes, continues to grow in proportion. With inquiries more numerous for coal and with some producers (especially in the smokeless regions) out of the market, prices have materially stiffened; run-of-mine in the Kanawha and Logan regions averaging from \$2.10 to \$2.50 a ton on spot sales and much higher in the smokeless fields. Labor is becoming somewhat scarce.

Under a steadily increasing demand, mines in the Kanawha region were, during the final week of May, being operated over a longer period per week; a scarcity of miners, however, limiting the running of mines to about two-thirds of the week. Consequently production during the last week of May was not over 60 per cent., or about 125,000 tons, although some operations were engaged throughout the week in getting out coal. In West Virginia the markets are beginning to seek the coal instead of the coal seeking the market, some companies no longer being in the market. Consequently prices are stiffening and much Kanawha coal is beginning to be sold around \$2.50 a ton in connection with spot sales.

New River operations were unable to furnish the full quota of coal for which they had a market during the last week of May, owing to adverse transportation conditions. Cars were so scarce that in certain portions of this field mines lost two days out of the six, although warranted by orders on hand in running to capacity. Such a condition was extremely inopportune, as there were a number of vessels at tidewater waiting to be loaded with New River coal. Of course it was impossible under such transportation conditions to meet all requirements of general Western and Lake markets. At the same time a shortage of miners, amounting to about 25 per cent., also contributed to hold down production; it otherwise would have been up to capacity, market conditions causing spot coal to go over \$3 a ton for run-of-mine in the New River region.

Springfield, Ill.

Miners, operators and school authorities, in conference at Springfield, Ill., went on record as favoring the apportionment of a

part of the Smith-Hughes fund for vocational education of Illinois miners. Illinois has been allotted \$400,000 for distribution among the industries for the training of workers, upon the appropriation by the state of an equal sum. At the meeting unqualified approval of the plan was given by Joseph C. Thompson, State Director of Mines and Minerals, and also by other speakers. When Thompson, however, said that every boy in the mines had an ambition to become a mine manager or superintendent, Peter Joyce, of Springfield, member of the state Mining Investigating Commission, dissented. Union miners, he said, would oppose it if it was designed solely to manufacture mine managers. "What we want is technical education for all," he said. "The miners need greater knowledge of mines and mining that they may be better able to cope with the dangers which surround them at work. Heretofore the state and Federal governments have been anything but willing to encourage such training."

The conference adopted a resolution endorsing the bill pending in the Legislature for the appropriation of \$10,000,000 to the state school distribution fund. This fund is now \$4,000,000. The increase is intended to facilitate vocational instruction in mining communities.

President Frank Farrington of the United Mine Workers presided at the afternoon session. W. S. Deffenbaugh, specialist in city school systems of the United States Bureau of Education, spoke on: "Some Suggestions for Improvement of School in Mining Towns." F. L. Heehn, superintendent of Gillespie public schools, discussed: "What Industrial Occupation Should be Given to Regular Day Pupils in Mining Communities?" E. A. Wreidt, State Supervisor of Industrial Education, spoke on "State and Federal Aid for Practical Instruction in Mining." Coal operators of the district were represented on the program by President H. C. Adams of the Central Illinois Coal Operators' Association, who heartily approved the plan for vocational training. The action in favor of vocational training was unanimous.

PENNSYLVANIA

Anthracite

Pottsville—A local company recently started work on a new stripping for the Buck Run Coal Co. at its Darkwater colliery near St. Clair.

Scranton—It is stated that four buildings in a block on West Lackawanna Ave., of this city, were demolished on June 2 by surface subsidence over the workings of the Oxford mine of the Peoples' Coal Co.

Sanbury—The Philadelphia & Reading Coal and Iron Co., on June 1, paid \$103,000 for land taxes for 1918 into the Northumberland County treasury. This covers assessments on coal properties held by the corporation, which are now assessed at an average of \$200 an acre. There is an agitation for an increase in valuation of this property.

Shenandoah—The Lehigh Valley Coal Co. announces changes of officials at Packer Nos. 3 and 4 collieries. Reuben Ball, for 20 years inside foreman at Packer No. 4 is retired on account of failing health. Richard Kane, inside foreman at No. 3 succeeds Mr. Ball, while John Rudd, assistant inside foreman at No. 4 is promoted to the foremanship at No. 3.

The Lehigh Valley Coal Co.'s Packer No. 5 colliery, which has been idle since February because of a scarcity of labor, resumed operations on June 2. The colliery is one of the largest in the district, and while the operation will be shorthanded, it is expected enough men are available to keep the place operating full time. All unemployed contract miners and laborers were given employment.

Wyoming—The Mount Lookout Coal Co. has filed appeals from the county assessment and valuation of its property in Wyoming, West Wyoming and Exeter bor-

oughs. They allege that the valuation is in excess of the price the property would bring at a bona fide sale. The value fixed on the coal was placed at \$300 an acre for every foot of coal in thickness and lesser sums down to \$120 a foot-acre.

Wilkes-Barre—In offering prizes for the best garden plots and the most attractive yards, the Lehigh & Wilkes-Barre Coal Co., is extending its policy of improving the homes and living conditions of its employees. During recent years the company has not only done away with the red houses of the old mining towns—row on row, all alike—substituting for them neat and individual homes, but has also developed whole villages of modern homes. These houses are leased at low rentals to its employees, rentals far below what would be ordinarily charged tenants for houses of the same grade.

Bituminous

Chicasaw—The Allegheny River mining Co., of this place, intends to install additional boilers and stokers for all boilers at its Chicasaw mine. Mr. G. White is superintendent at this plant.

New Bethlehem—Mr. James Sullivan is operating a small mine at this place but expects to enlarge the operation in the near future by putting in a siding and tippie in order to load coal onto railroad cars.

Library—The Montour No. 10 mine of the Pittsburgh Coal Co., which has been under construction for nearly a year, expects to commence shipping coal about July 1. This plant will be a big producer and has two slope openings. The coal will come to one tippie which is equipped with Marcus screens and picking tables. This operation is on the Montour railroad, near this place.

Uniontown—The Orient Coke Co. held its annual meeting at the plant in Redstone Township near this place on May 15. The following officers were elected: Julian Kennedy, president; Robert Bentley, first vice president; J. W. Kennedy, second vice president; J. O. Miller, secretary-treasurer, and R. M. Fry, general manager. The directors are Julian Kennedy, Robert Bentley, Youngstown, O.; J. W. Kennedy, J. O. Miller, Julian Kennedy, Jr., and David Davis, Pittsburgh, and R. M. Fry, Uniontown.

Waynesburg—A sale of Greene County coal took place here recently. An undivided one-seventh interest in 37 tracts of coal in Cumberland, Jefferson and Monongahela townships, owned by James M. Hustead, of Uniontown, was sold at sheriff's sale. The interest in the several tracts aggregated 453½ acres and the total consideration was \$226,905.

Another sale aggregating 275½ acres was purchased by W. J. Kyle, of this place, for the Cumberland Coal Co., of Pittsburgh; consideration \$138,100. An interest, including 177½ acres, was purchased by W. C. Montgomery, for Paul J. Bickle, of Cleveland, Ohio; consideration \$88,805.

Pittsburgh—Negotiations for the sale of the J. V. Thompson estate have recently approached the final stages of a deal which may rank as the largest single transaction in coal lands. The trustees of the Thompson estate and the members of the J. V. Thompson Creditors' Committee have had conferences with the legal representatives of probable buyers. While there is much conjecture as to the identity of the buyers, the ultimate purchaser is generally supposed to be the H. C. Frick Coke Co., a subsidiary of the U. S. Steel Corporation.

On June 1 the name of the United Coal Corp. was changed to Hillman Coal and Coke Co., at which time the business of J. H. Hillman and Sons Co. was taken over. The general offices of the company are in this city. The following are the officers of the Hillman company: J. H. Hillman, Jr., chairman of the board; F. W. Guthrie, president; A. B. Sheets, vice-president; Ernest Hillman, vice-president; Thomas Watson, vice-president and secretary; Robert W. Flenniken, treasurer; F. B. Lockhart, Genl. Mgr. of sales, and M. D. Flanagan, asst. general manager of sales.

An important meeting was held on June 3 by the Pittsburgh Coal Producers' Association at this place. The coal situation as it is today and for the coming fiscal year was discussed by J. D. A. Morrow, vice-president of the National Coal Association; R. W. Gardiner, commissioner for the Pittsburgh Coal Producers' Association, and a number of the association members also took part in the discussion.

Branches of the National Coal Association have been established in Chicago, Cincinnati as well as Pittsburgh and soon one will be established in Washington, D. C. A general warning is being sounded by prominent government and other officials connected with coal production and distribution in regard to a serious coal shortage impending.

WEST VIRGINIA

Princeton—On May 28 the Virginian Railway exceeded all previous records; one train out of this place bound for tide-water was made up of 100 cars carrying 7922 tons of coal; this train was being moved east. The 100-car train was about 20 cars longer than the average train.

Fairmont—F. R. Lyons, of the Consolidation Coal Co., conferred with the division managers of this company recently; the purpose of this conference was to discuss problems of operation growing out of the changed conditions of the last few months. The division managers present were: C. H. Tarleton, of West Virginia; J. M. Gilbert, of Maryland; J. G. Smythe, of Jenkins, Ky.; E. R. Rice, of Van Lear, Ky., and S. Steinbach, of Pennsylvania.

Welch—Officers were re-elected at the annual meeting of stockholders of the Panther Coal Co., Lathrop Coal Co., and the Leckie Collieries Co., held here on May 28. The president of all three companies is Wm. Leckie. Other officers re-elected were W. R. Graham, vice president of the Lathrop and Panther Coal companies; A. F. Leckie, vice president of the Leckie Collieries Co.; A. E. Jennings, secretary and treasurer, and A. F. Leckie, assistant general manager of the trio of companies.

Huntingham—Coal operators of West Virginia and eastern Kentucky are endeavoring to press into service about 20,000 new coal cars which were constructed under Government orders last year; since that time these unnamed cars have been standing idle on side tracks. The U. S. Railroad Administration purchased cars for a number of coal carrying roads for \$3000 each; some of the cars were accepted by the Chesapeake & Ohio railroad but other carriers turned them down. The growing demand for coal makes the use of this equipment imperative, operators say, and a move is on foot to get them into service at once.

Morgantown—The seventh annual short course for miners will be held at the West Virginia University at this place from June 16 to July 26. Professor Callen will have charge of the course and he will be assisted by R. Z. Virgin and H. E. Gray—all connected with the university. The only entrance requirements for this course are the ability to read and write. There is no charge for instruction and no fees of any kind. Address R. Z. Virgin for further particulars.

OHIO

Wellston—The Wellston Hill Coal Co. has recently completed negotiations for the purchase of the properties of the Coalton Fuel Co., located in Washington Township. It is understood that the tract comprises a total of about 440 acres.

McArthur—Frederick C. Newberry, Jr., of Philadelphia, has purchased at sheriff's sale 7,019 acres of coal land in Clinton, Vinton and Elk townships, of this state, for which he paid \$109,000. The lands have been inspected just recently by a legislative committee with a view of purchasing them for state mines.

Columbus—Public utility interests are discussing the Robinson bill, which has passed the Ohio House of Representatives and is expected to pass the Senate after the recess. Some profess to see an effort to bring coal mines under the authority of the Ohio Utilities Commission; coal mine owners are investigating the bill and having legal talent go over it.

ILLINOIS

Edwardsville—A new mine has been started south of this place by the Donk Coal Co., of St. Louis, Mo. The engineering and constructing firm of Allen & Garcia, Chicago, is connected with the work and it is understood that the plant will have a capacity of 5000 tons daily. It is planned to be a high class modern plant with a skip hoist. Operations commenced May 20 and contracts have been let for machinery. The plant should be producing by fall.

Divernon—The Madison Coal Corporation broke the record for hoisting coal for the second time during the month of May at its No. 6 mine at this place. It is stated

that the first record was established on May 7 when a total of 4003.6 tons or the equivalent 1352 mine cars were hoisted. On May 24 the total tonnage raised to the surface from No. 6 shaft, during an 8-hr. day, was 4106.2 or 1376 mine cars. This company has 700 employees of which number 375 are loaders. The engineers at the throttle during the hoisting were, J. F. Woolford, Frank McVeigh and J. G. Larken.

KENTUCKY

Louisville—Some big coal land developments in eastern Kentucky are in sight as a result of a decision by the Court of Appeals, ordering dissolution of the Louisville Property Co., and appointment of a receiver. This organization is a subsidiary of the Louisville & Nashville Railroad Co., which has held large tracts in eastern Kentucky said to be approximately 75,000 acres. The company is reported to have blocked development, endeavoring to secure arrangements whereby all coal from the district would go over its lines. Minority stockholders brought action.

ALABAMA

Kennebunk—The Yolande Coal and Coke Co., Birmingham, has awarded contracts for electrical mining equipment, including hoisting machinery, pumps, etc., to be used in connection with the development of a new mining property. Contract has also been awarded for a new electrical haulage road for the works. The contracts are estimated to amount to \$150,000. N. B. McClary is president and general manager.

Birmingham—At the annual meeting of the Alabama Coal Operators' Association held on June 3 the following officers were elected: George B. McCormack, president; Chas. F. DeBardleben, vice president, and James L. Davidson, secretary-treasurer. All of these executives succeeded themselves in office. George G. Crawford, president of the Tennessee Coal, Iron and Railroad Co., was elected chairman of the executive committee, with George F. Peter, J. B. McClary, F. H. Crockard and Walter Moore as associate members.

The Corona Coal and Iron Co. has closed a contract with the Universal Coal Washer Co., of Birmingham, Ala., to erect a 600-ton washery at its No. 2 mine at Townley, Ala. The washer company will install Burks & Hayes jigs in the new plant which is to be ready for operation by Sept. 14.

MONTANA

Sheridan—O. P. Hood, chief mechanical engineer of the Bureau of Mines recently visited the sections of the Northwest having lignite deposits. The Government recently authorized the expenditure of \$100,000 for a lignite experimental plant and it was with a view of investigating this territory for a possible site for such a plant that the trip was made.

Personals

O. C. Huffman has been appointed general superintendent of the W. E. Deegans Coal Co., in charge of the mines of this company on the line of the Virginian Ry. as well as on Coal River.

John Huns has been appointed superintendent of Mine No. 11 of the Jamison Coal and Coke Co.; this mine being known as the Lehigh operation of the Jamison company. He succeeds **John Malloy**, resigned.

H. L. Garbutt, for the last six years manager of the line material section of the Westinghouse Electric and Manufacturing Co. at East Pittsburgh, Penn., has been appointed manager of the supply division of the Westinghouse San Francisco Office.

H. C. Hawes, formerly manager for the Salt Lick Coal Co., has been made resident manager of the Wells-Elkhorn Coal Co., in charge of the Salt Lick and Black Diamond operations, succeeding W. C. Hawes, at one time manager of the Black Diamond Coal Co.

James W. Paul, secretary of the Mine Inspectors' Institute of the United States of America, has just returned to Pittsburgh from a trip to Indianapolis where he completed the arrangements for the holding of the decennial meeting of the institute, July 8-11, the announcements of which will soon be issued to the members. A good program

will be presented and all mine inspectors and deputies and assistant inspectors are urged to be present.

W. C. Tyler, formerly district manager for the Poole Engineering and Machine Co., has been appointed general sales manager in charge of all the selling activities of the company. On May 1 this company removed its general sales office from Baltimore, Md., to 50 Church St., New York City, where all correspondence pertaining to sales should be addressed.

James Inglis, president of the American Blower Co., of Detroit, Mich., sailed from New York recently as a member of a commission appointed to confer with a certain European industrial interest on post war conditions in the industry throughout the world. Mr. Inglis will also visit Belfast, Ireland, to confer with his associate in the blower business, **Mr. Davidson**, of the Si-rocco Engineering Works.

A number of changes have been announced among the officials of the Mining Department of the Cambria Steel Co., of Johnstown, Penn. **Frank Horton**, former superintendent of Franklin mines Nos. 1 and 3 has been promoted to assistant superintendent, taking the place of **Joseph Lewis** who goes to Mariana, Penn. **David Malcolm** becomes superintendent of the Rolling Mill mine. **Duncan May** takes the place of Mr. Horton as superintendent of the Franklin mines.

William A. Holley, assistant general freight agent in charge of coal traffic for the Burlington railroad, resigned recently to accept the position of traffic manager for the Central Illinois Coal Traffic Bureau, with headquarters in Chicago.

This Bureau was organized recently by the coal operators in the Springfield District of Illinois, which produces approximately forty per cent. of the coal mined in the state.

This new organization is formed for the purpose of handling in a uniform manner all traffic matters of interest to the membership and their customers.

Obituary

James T. Armstrong died recently at the age of 65. He was formerly president of the Mansfield Coal and Coke Co. He was also connected with several banking institutions.

James Wrigley, senior member of Cutler-Wrigley Coal Co., died May 29 of heart trouble. Five years ago he was instrumental in the organization of this company, of which his son, **Robert Wrigley**, is now the president.

Coming Meetings

American Institute of Mining and Metallurgical Engineers will hold its fall meeting Sept. 22 to 26 in Chicago, Ill. Chairman Chicago meeting, **Carl Scholz**, 547 West Jackson Boulevard, Chicago, Ill.

American Society of Mechanical Engineers will hold its spring meeting at the Hotel Statler, Detroit, Mich., June 16 to 19. Secretary, **Calvin W. Rice**, 29 West 39th St., New York City.

American Institute of Electrical Engineers will hold its annual convention at the Lake Placid Club, Adirondacks, N. Y., June 24 to 27. Secretary, **F. L. Hutchinson**, 29 West 39th St., New York City.

Northeast Kentucky Welfare and First Aid Association will hold a first-aid contest July 4 at Pikeville, Ky. Secretary, **E. H. Sowards**, Pikeville, Ky.

The Rocky Mountain Coal Mining Institute will meet in Salt Lake City the first week in July, 1919. Secretary, **F. W. Whiteside**, Denver, Colo.

American Society of Civil Engineers will hold its forty-ninth annual convention in St. Paul and Minneapolis, Minn., June 17 to 20. Secretary, **C. W. Hunt**, 33 West 39th St., New York City.

Mine Inspectors' Institute of the United States of America will hold its annual meeting July 8 to 11 at Indianapolis, Ind. Secretary, **J. W. Paul**, Pittsburgh, Penn.

Recent Coal and Coke Patents

Briquet Machine. G. Kormarek, assignor to St. Louis Briquet Machine Co., St. Louis, Mo., 1,295,764. Feb. 25, 1919. Filed Feb. 5, 1918. Serial No. 215,445.

Coal Pile. A. C. Johnston, assignor Link-Belt Co., Chicago, Ill., 14,598. Feb. 25, 1919. Filed Dec. 14, 1918. Serial No. 1,256,569.

Pneumatic System for Cleaning Coal. W. E. Winn, Pittsburgh, Penn., 1,295,248. Feb. 25, 1919. Filed Mar. 3, 1917. Serial No. 152,251.

Locomotive Stoker. N. M. Lower, assignor to Locomotive Stoker Co., a corporation of Pennsylvania, 1,296,541. Mar. 4, 1919. Filed May 9, 1918. Serial No. 233,453.

Coal-Fired Boiler Furnace. G. Wilkin-son, Harrowgate, England, 1,296,247. Mar. 4, 1919. Filed May 14, 1917. Serial No. 168,456.

Combined Coal and Gas Burning Furnace. H. C. Smart, assignor to Standard Oil Co. of New York, N. Y., 1,296,224. Mar. 4, 1919. Filed Sept. 11, 1917. Serial No. 190,739.

Furnace. P. Moquist, Minneapolis, Minn., 1,296,306. Mar. 4, 1919. Filed June 11, 1917. Serial No. 173,946.

Mine Car Wheel. H. W. E. Brosi, Girard, Kan., 1,296,914. Mar. 11, 1919. Filed Nov. 2, 1918. Serial No. 260,877.

Trade Catalogs

Vesuvene. Swan & Finch Co., New York, N. Y. Folder. Pp. 4; 3½ x 6½ in.; illustrated. Notes the application of this waterproof lubricant to wire rope, exposed gears, etc.

The Steam Motor. The Steam Motors Co., Springfield, Mass. Bulletin No. 5. Pp. 24; 8½ x 11 in.; illustrated. Notes the various points of the design and application of this steam turbine.

Electrical Insulation. Chicago Mica Co., Valparaiso, Ind. Catalog No. 26. Pp. 48; 6 x 9 in.; illustrated. Describes fully the company's line of standard and special mica insulation in its various forms.

Zelnicker's Bulletin—No. 263. W. A. Zelnicker Supply Co., St. Louis, Mo. Folder; Pp. 4; 3½ x 8½ in.; illustrated. Describes portable hand power pipe threading machines; steel tray bodies, special lamps, etc.

Boss Mixers. Boss Hoists—Elevators. American Cement Machine Co., Inc. Catalogs Nos. P20 and H20, respectively. Pp. 10 each; 8½ x 11 in.; illustrated. These catalogs describe concrete mixers and hoisting engines and elevators used by builders.

Chain Drives, by J. S. White. Morse Chain Co., Ithaca, N. Y. Pamphlet; reprint from 1919 Year Book of National Association of Cotton Manufacturers. Pp. 12; 6½ x 9 in.; illustrated. A short synopsis of the general subject of chain driving showing application to textile industries.

Metal Melting Pots. Soldering Irons. Sockets to Harmonize. The Cutler-Hammer Manufacturing Co., Milwaukee, Wis. Folder—pp. 6; 3½ x 6 in.; illustrated. Booklet—pp. 8; 3½ x 6 in.; illustrated. Folder—pp. 4; 3½ x 6 in.; illustrated. These publications describe specialties of the Cutler-Hammer company.

Industrial News

DuQuoin, Ill.—The Victory Collieries Co., of this city, operating the Victory mine at Tamaroa, north of here, has recently moved its main office to Chicago. This company formerly went under the name of the Paradise Franklin County Coal Co.

Steuenville, Ohio—Rapid progress is being made in the opening of the new Rigby mine of the Akron Coal Co. here, and it is planned to have the plant in operation as quickly as possible. The J. W. Williamson Contracting Co. of Columbus, Ohio, is doing the work.

Paintsville, Ky.—The Wells-Elkhorn company is planning the development of 2000 acres of coal land on Beaver Creek where

it will mine the Elkhorn seam. At the Salt Lick and Black Diamond mines of the company new mine openings will be made. The company is under the management of C. O. Messenger.

Huntington, W. Va.—A \$100,000 concern has been organized in this city for the purpose of manufacturing mine equipment of various kinds. H. T. Lambert of this place is at the head of the company which will have its plant here. Associated with Mr. Lambert are H. G. Clark, Gladys Baker, C. F. Cunningham and R. M. Davis.

McCuneville, Ohio—About July 1 the Kehota Mining Co., opened another stripping operation here near Shawnee. With the three stripping operations of this company going, the capacity will be about 5000 tons daily. The product is sold through the Pittsburgh & Bessemer Coal Co., of Columbus.

Childs, Penn.—The coal mine owned by H. R. Stone & Co. changed hands recently, when the interests were purchased by W. T. Spruks of Scranton. There is a small breaker on the tract, but it is stated that the new owner intends to make extensive improvements, enlarging the breaker and the mine so as to ship coal on a larger scale.

Beekley, W. Va.—The Simrall Coal Co., recently incorporated, has completed preliminary survey work in connection with the proposed development of its properties in the Winding Gulf district in Raleigh County. Dr. George Hogg is president; P. M. Snyder, vice-president, and F. T. Drumheller, secretary-treasurer.

Charleston, W. Va.—Surveys have been made for the plant of the Fryland Coal Co., which is to operate near Cedar Grove, in Kanawha county; no time will be lost by the company in proceeding with construction plans. The company was recently organized by William T. Slicer of Charleston; C. G. and Johnson Fry, of Ceredo; Floyd Chapman of Huntington and Charles E. Howland, of Nitro.

Carlinville, Ill.—Development of a large tract of coal land in Macoupin County will soon be started by the Sinclair Oil and Refining Co. The land is next to the coal rights purchased several years ago by the Union Coal Co. It is said that another company known as the Hunt Construction Co. will also develop the Sinclair field and that the two large mines will each have a daily capacity of 4000 tons.

Steuenville, O.—The Commonwealth Coal Co. has recently completed negotiations for the purchase of the mines and holdings of the Genree Coal Co., located in the vicinity of Martins Ferry, W. Va., for a consideration of about \$40,000. It is understood this company is planning improvements to increase the present capacity. This company recently acquired the holdings of the Burlington Coal Co., located in the same section, for a consideration of about \$60,000.

Minneapolis—Representatives from the Northwest appeared before Robert Wright of the Federal Railroad Administration recently to protest a freight advance of 30c. a ton on coal shipped from Illinois mines to the Northwest. Minnesota, the Dakotas, Wisconsin and northern Iowa, get coal from Illinois. It is estimated that 9,000,000 tons will be shipped to this section this year. The new rate which is being opposed is supposed to go into effect July 1 and the freight increase amounts to \$2,700,000.

Du Quoin, Ill.—Activity in coal development in the vicinity of this place continues. Announcement is made of the sinking of a new shaft about two miles southwest of Du Quoin to be operated by the J. R. Crowe Coal and Mining Co., of Kansas City, Mo. When completed it is expected that the new plant will employ from 800 to 900 men. Charles Duncan, of Pittsburgh, Kan., completed the drilling of this property about a year ago. This new plant will make a total of seven shaft mines and one stripping within a radius of five miles of this town.

Birmingham, Ala.—The stockholders of the Railway Fuel Co., will meet in Birmingham, June 16, at which time they will vote on the proposition of issuing a first mortgage on their coal properties to secure a loan of not exceeding \$1,000,000. Consideration will also be given to increasing the capital stock of the company \$150,000. The Railway Fuel Co. owns extensive coal properties in Walker County, near Parrish, Ala., and is producing coal from a mine developed about a year ago. The company is allied with the Southern Railway interests and the entire output of the mine is used by the lines of that system.

MARKET DEPARTMENT

EDITED BY ALEX MOSS

Weekly Review

Bituminous Market Slowly Improves—Shortage in Late Fall If More Consumers Do Not Stock Coal—Anthracite in Good Demand—Domestic Sizes Scarce—Steam Sizes Hard To Move

ABSOLUTELY devoid of any untoward incident, the coal market this week presents much the same characteristics that have distinguished it during the past month or more. The bituminous coal operators are slowly winning a more advantageous position, while the producers of anthracite are enjoying what gives promise of being an unparalleled summer business.

Again it must be emphasized that unless consumers take in more soft coal during the next few months than they have been stocking, there will be a coal shortage in the late fall. The mines must be stimulated to produce

maximum tonnages, for output is growing smaller. Bituminous coal production is now 30 per cent. of the production in the same period last year. The output of soft coal in the last week of May, estimated at 7,930,000 net tons, is more than 2,600,000 tons lower than the production of the corresponding week in 1918.

From the figures at hand, it would appear that the production of bituminous coal this year cannot be greater than 500,000,000 net tons. At the beginning of the calendar year investigation disclosed that there was a reserve stock of bituminous coal in the hands of con-

sumers of about 30,000,000 net tons. Most of this reserve is now gone. There is sure to be a scramble for coal late this year—and prices will soar.

The domestic grades of soft coal are holding up well in price, but steam coal at the present time is going at all sorts of prices. Few contracts are reported.

Anthracite production during the week ended May 31 dropped to 1,285,000 net tons. Stove, egg and chestnut continue to be in urgent request. The steam sizes, such as pea, buckwheat and barley, are hard to move and price concessions are being made to dispose of them.

WEEKLY COAL PRODUCTION

The production of bituminous coal, which gained steadily for four weeks and reached a maximum since Apr. 1 of nearly 9,000,000 tons in the week ended May 24, declined in the last week of May to 7,930,000 tons, a decrease of 9 per cent. The production in the last week of May, 1919, was more than two and one-half million tons, or 25 per cent. below that of the corresponding week of last year. The production of bituminous coal in the first five months of 1919 is 177,340,000 tons. The production in the corresponding period of 1918 was 234,632,000 tons, which exceeds the production for the same period of this year by 57,000,000 tons, or 24 per cent. In the six years 1913 to 1918 the percentage of annual output of bituminous coal in the first five months of the calendar year averaged 40 per cent., the lowest being 36 per cent. in 1915 and the highest being 41 per cent. in 1914, in 1916 and in 1917. If the production of the first five months in 1919 represents 40 per cent. of what will be mined this year, the production for 1919 is thus indicated to be but 446,000,000 tons; if, as in 1915 the output in the first five months is 36 per cent. of the total for the year, an output of 495,000,000 tons is indicated for the calendar year 1919. These facts appear to indicate that the production of bituminous coal this year cannot be greater than 500,000,000 net tons. Whether this quantity added to the surplus stock on hand at the first of the year, estimated around 30,000,000 tons, will be sufficient for the needs of the country depends upon whether general industrial activity recovers sufficiently to approximately equal that of the later part of 1916 and the early part of 1917.

The production of Pennsylvania anthracite in the week ended May 31 is estimated at 1,285,000 net tons compared with 1,656,000 net tons for the week ended May 24 and 2,005,000 tons for the last week in May, 1918. From the records for the first five months of 1919 an output of approximately 80,000,000 net tons is indicated for 1919, a decrease compared with 1918 of 9 per cent., and a decrease compared with 1914, the lowest output recorded in the past six years, of more than 8 per cent. The rate of production of anthracite in the first nine weeks in the present coal year has been approximately 1,600,000 net tons compared with 1,940,000 net tons for the same period of last year and 1,900,000 tons for the calendar year 1918. The rate of production of anthracite has shown a tendency to increase slightly and can be increased even more if domestic consumers will enter the market to even a greater

extent for their supply of household fuel for next winter.

Production of beehive coke in the United States in the week ended May 31 is estimated at 264,645 net tons compared with 250,810 net tons in the week ended May 24, and 582,204 net tons in the week ended June 1, 1918. For the calendar year to date the production is estimated at 8,481,000 tons compared with 12,547,000 tons for the corresponding period of last year. Excepting West Virginia, all beehive coke districts recorded improvement in production in the last week of May, but in all districts the output for the week and for the year to date is much below that of the corresponding period of last year.

Bituminous coal dumped at the lower lake ports, including vessel fuel, for the week ended May 24 is reported as 906,201 net tons compared with 911,309 tons in the week ended May 17, 1919, and 713,126 net tons in the week ended May 25, 1918. The season's dumpings to May 24 are 4,038,358 tons compared with 3,556,137 tons in the corresponding period of last year. Shippers of lake coal, particularly those shipping on their own account, are taking advantage of the slack demand in the central competitive markets to forward their supplies to the head of the lakes.

BUSINESS OPINIONS

The Iron Age—The activity in the steel market continues in an encouraging way, without broadening to any marked degree. Mill operations are on a slightly increased scale. Some phases have been overrated, particularly the amount of third quarter and second half buying, which is quite moderate. Price irregularities continue, but the schedule of Mar. 20 holds its place as the market standard. The concessions are in sheets, hot rolled strips, steel bands and some other of the lighter products.

American Wool and Cotton Reporter—There has been heavy rain in the cotton belt and unless the weather changes a number of the fields will have to be abandoned as the crop is getting grassy. An advance in prices last week caused certain hesitation and the buying has been rather scattered. This advance also affected the dry goods market as it has caused buyers to hesitate to pay the high prices that the mills have to ask.

Marshall Field & Co.—Current wholesale distribution of dry goods is running slightly ahead of the large volume of the corresponding week a year ago. Merchants are visiting the market frequently and were in the house in greater numbers compared with the corresponding week of 1918. Re-

tail business continues excellent. Orders from salesmen on the road for both immediate and future delivery are much greater in volume than for the corresponding week last year. Collections are satisfactory.

Atlantic Seaboard

BOSTON

Signs of improved market. A distinct upward swing needed, however, before buyers put much faith in prices for fall and winter. Export prices advance at Hampton Roads. New York and Philadelphia pier markets very dull. Increasing allocations of steamers for over-sea coal trade indicate heavy movement later. Anthracite demand continues, Boston retail prices advance.

Bituminous—Almost it would seem that prices are on the point of changing. There is nothing tangible to report as yet, and only in scattered instances is there any less anxiety to place spot tonnage, but beyond question the outlook for the near future is much improved. The recent Navy bids and the fact that relatively so small a tonnage was offered have shown how much better is the feeling in the trade as to prices for fall and winter delivery. Some shippers have now definitely declined to take more contracts until the general situation is somewhat cleared up, and from this attitude on their part it will only be a short period, probably, before buyers show a belated interest in contract prices.

There may be an absence of price movement until July, for much will depend upon the extent to which consumers will enter the market. The undertone is distinctly favorable to higher prices for season delivery and it is only a matter of a few weeks now before spot quotations will be on a higher level than has obtained recently. A large number of buyers who have been "trying coals" have now about made up their minds to purchase, and it is likely the next fortnight will disclose some more or less active buying. This market, however, will be still confined very largely to Pennsylvania grades, both all-rail and by water, for the Southern smokeless coals are on the same high basis alongside that has prevailed for several months.

Buyers in general find it hard to reconcile the low prices so recently submitted to the railroads with the contract figures now being asked by the trade. It is as if various operators had now decided they

had sold all the low-priced coal necessary and for the rest of their tonnage were determined to get a better return. Of course, the railroads have not been the only beneficiaries, but railroad purchases have been well advertised and their effect upon the current market has been quite pronounced. It will take a distinct upward swing to convince New England buyers that a shortage next winter is a real possibility.

It is rumored here that export prices at Hampton Roads have been advanced from \$5.60 to \$6 f.o.b. ship, and it is known that certain of the smaller agencies who were naming spot prices down to \$4.69 have now withdrawn quotations that were below \$5.14 for coastwise business. For the first time in months a few steamers have met with delay at the loading piers, and although the detention has not been at all serious it gives point to firmer quotations. Distinctly there is a better feeling among the Pocahontas and New River shippers, and while New England apparently has little to do with it the factors here are encouraged by the prospect for export business which will doubtless have some reaction here. Distributors of the smokeless coals in cities like Boston and Providence have been closing up retail business lately in more volume than at any time thus far this season. The city of Providence bought 13,000 tons Pocahontas this week at \$9 per net ton of 2000 lb. delivered by truck.

All-rail there is better inquiry than a fortnight ago. A few large buyers are coming into the market, but they are very coy about it and it is difficult to get much line on prices.

At New York and Philadelphia the demand for coal over the piers continues light. Shippers who submitted prices to the Navy Department are still in doubt as to the tonnage that will be required and this makes for a good deal of uncertainty as to sales for future delivery. There are those who think that the strong arm of the Fuel Administration will be made use of to get the Navy Department's stated quota. At the same time the spot market is listless and prices are about on the same level as for weeks past. There is some difficulty over arranging for barge transportation on contract through the winter and that has a depressing effect on efforts to arrange for contract coal. To an increasing extent shippers are insisting upon labor clauses in all contracts.

Perhaps the biggest factor in trade prospects is the amount of tonnage being allocated for overseas shipment. It is understood these allocations are to be steadily increased from month to month because of the heavy movement of American coal that will be absolutely required to keep Italy and other countries sufficiently supplied to enable industries and service plants to function properly. Taken together with labor shortage in the Pocahontas and New River districts this will probably mean a steady drain of a very large tonnage of the smokeless coals from Hampton Roads.

Current quotations on bituminous at wholesale are about as follows:

	Clearfields	Cambrias and Somersets
F.o.b. mines, net tons....	\$2.15@2.75	\$2.75@3.35
F.o.b. Philadelphia, gross tons.....	4.27@4.95	4.95@5.50
F.o.b. New York, gross tons.....	4.62@5.29	5.29@5.85
Alongside Boston (water coal), gross tons.....	6.10@6.85	6.90@7.35

Georges Creek is quoted at \$3.20 per net ton f.o.b. mines.

Pocahontas and New River are being quoted at \$4.69@5.14 per gross ton f.o.b. Norfolk and Newport News, Va. Alongside Boston the same grades are being offered at a range of from \$7.10@7.34, and on cars Boston and Providence at from \$7.50@7.90 per gross ton, the latter being the contract price f.o.b. cars for deliveries to April 1.

Anthracite—The city markets in New York and Philadelphia have eased just enough to make loading for New England a shade less difficult. This has been noticeable only since the 10c. advance became effective June 1 and it remains to be seen whether the same condition will hold true the latter part of the month. Egg, stove and chestnut are still the sizes in greatest demand and there is continual detention at most of the piers. It is expected dispatch will improve this month and the various factors will make every effort to get coal forward to this territory where dealers' stocks are at a minimum. Retail demand is still insistent, and there

are as yet no signs of letup. The Boston retail dealers advanced prices on June 2 50c, to \$12 for egg, stove and chestnut, per ton of 2000 lb., sidewalk delivery. Broken and pea were allowed to remain at the May figures.

NEW YORK

Demand for egg, stove and chestnut continues. Supplies short and retail dealers receive barely enough to keep their help employed. Household consumers want their coal before vacation time. The steam sizes move slowly, and prices are being shaved. Bituminous tidewater market dull. Little coal moving, but dealers are optimistic. Large consumers soon to come into the market.

Anthracite—The anthracite market continues strong, with the so-called Independent domestic coals bringing premiums and the steam coals being let go at large concessions. The slogan, "Buy Your Coal Early," and the publicity of the various coal agencies, to say nothing of the warnings issued by the various Government departments, have all had their effect upon the consumer; and instead of the feeling of a few weeks ago that there was no hurry on their part, consumers are now anxious to get their bins filled.

Shipments are so slow at this port that retail dealers receive hardly enough of the larger sizes to keep their help busy, while their books contain orders enough to keep them busy for the next few months. The heaviest pressure on the dealers will come this month, as most household consumers desire to leave the city and are desirous of receiving their winter fuel before their departure.

The increase in production hoped for by the trade does not materialize to the satisfaction of the dealers because of various conditions, principally the lack of certified miners and the many holidays.

Stove, egg and chestnut, in the order named, continue to be strongest in demand, and those in a position to speak hesitate to give their opinion as to what might be the conditions next fall and winter knowing that the operators are not storing any of these sizes.

Pea coal is plentiful, but it is not necessary to use much force to effect sales as most dealers are willing to take some in order to get the larger sizes. The buckwheat coals are long and prices are easy in nearly all grades. A considerable tonnage is being stocked by the large producers and, so far as they are concerned, little is heard about concessions; but for the so-called Independent product there has been, so reports have it, much cutting of prices. Manufacturing plants are well stocked and there is a large volume of the three small coals in cars along the roads. Some grades of buckwheat are being quoted at the mines around \$2.75, while for rice \$2.25 has been heard and from \$1.25 to \$1.50 for barley, depending upon the quality of the coal.

During the period from May 30 to June 6 inclusive there were dumped at the local railroad terminals 5380 cars of anthracite as against 4366 cars the previous week, an increase of 1014 cars. During the days of May there were dumped at the piers 26,138 cars of anthracite as compared with 19,448 cars in April and 6439 cars in March.

The city will soon be in the open market for nearly \$100,000 worth of coal for the Fire Department, and Bellevue and Allied Hospitals. This is necessary because of the high prices submitted at the opening of bids on May 14, which in most instances were higher than the appropriations made for them.

Current quotations, white ash, per gross ton at the mines, f.o.b. tidewater at the lower ports, are as follows:

	Mine	Company Circular
Broken.....	\$5.95	\$7.80
Egg.....	6.05	7.90
Stove.....	6.30	8.15
Chestnut.....	6.40	8.25
Pea.....	5.00	6.75
Buckwheat.....	3.40	5.15
Rice.....	2.75	4.50
Barley.....	2.25	4.00

Bituminous—The local trade continues to be optimistic even in the face of the demoralized trade conditions here. There is little demand and free coals move slowly, yet notwithstanding these conditions there are tradesmen who are talking better prices within the next few weeks.

Their hopes are based on the knowledge

that manufacturers as a rule have been burning high-priced coal bought early last winter and that they are now able to see the bottom of their bins. This condition will drive consumers into the market soon, and those who have failed to close contracts will have to take what the market offers.

Existing conditions are anything but favorable. The tidewater situation is particularly unsatisfactory. There is practically none of the free coals moving and embargoes are the rule, not because shippers are sending large tonnages forward, but because of the lack of demand. The coal coming to tidewater would readily be absorbed under normal conditions, but with the slow buying someone stands a chance of losing out because of extra charges.

There is a strong desire on the part of some buyers to close contracts, but operators are in no hurry to take on additional burdens, especially for the better grades, even though the prices offered are strong and tempting. They are not so sure as to what might be expected from labor.

Conditions along the line are in much better shape than locally. Prices are strong and there is a better demand. Here quotations on coal in Pools 1, 9 and 71 range from \$2.25 to \$2.75, based on mine prices; Pool No. 10, around \$2.20; and Pool No. 11 around \$2.

With so many large consumers running low of coal indications point to an active demand in the early fall and a big shortage in production to be overcome.

There were dumped at the local railroad piers 6511 cars of bituminous during the period May 30 to June 6, inclusive, as compared with 5378 cars the previous week, a gain of 1233 cars. During May there were dumped 25,271 cars of bituminous as compared with 20,708 cars in April and 11,516 cars in March. There were 4664 cars standing on tracks at the docks on June 6.

Quotations on the various grades, mine price, for spot and contract delivery, range as follows:

	Spot	Contract
South Forks.....	\$2.90@3.25	\$2.95@3.50
Cambria County (good).....	2.75@2.95	2.95@3.25
Clearfield County (good).....	2.50@2.75	2.80@2.95
Reynoldsville.....	2.50@2.75	2.75@2.95
Quemahoning.....	2.65@2.85	2.95@3.10
Somerset County (best).....	2.50@2.75	2.95@3.10
Somerset County (poor).....	2.00@2.35	2.50@2.75
Western Maryland.....	2.25@2.50	2.50@2.75
Fairmont.....	2.00@2.25	2.35@2.50
Latrobe.....	2.10@2.25	2.25@2.40
Greensburg.....	2.25@2.35	2.35@2.60
Westmoreland 1-in.....	2.60@2.75	2.60@2.75
Westmoreland run-of-mine.....	2.35@2.60	2.35@2.65

PHILADELPHIA

Anthracite production fully absorbed. Torrid weather slows retail demand. New orders from consumers decrease. Stocks on hand light, except pea. Good buying expected all summer. Slight falling off in egg demand. Stove extremely short, but not in moderate supply. Pea being stored by dealers. Steam sizes quiet, with some of all sizes going to storage. Collections good. Bituminous displays slight activity. Prices firm.

Anthracite—The torrid weather of the past week, with the temperature going beyond ninety on successive days, has apparently made the dealers less eager in their call for increased shipments. It may be that many of the retailers have exaggerated their needs and now find they have been able to clean up most of their orders much earlier than they thought. We have interviewed quite a number of dealers the past few days and most of them admit they expect to deliver every order on hand during the present month. Practically every dealer states that the new business being booked is very light.

Most yards contain only a small tonnage of egg, stove and chestnut, and the dealers will surely continue to buy until they have capacity stocks; in fact all representative dealers have so expressed themselves. It has been pointed out, however, that when deliveries fall off it requires no extraordinary tonnage to fill the several hundred yards located here, the majority of which are of but small capacity.

Opinions vary as to how the different family sizes will hold up during July and August. It is taken for granted that none of them will cause any concern until then. When the situation is analyzed, though, we believe that the demand for coal all summer will be heavy, much more so than normal.

Egg at this time is commencing to show a slight falling off, and while a substantial demand continues it will hardly remain that way throughout the summer. This will cause no uneasiness to the shippers, as the New England market will absorb all of the surplus. It will be recalled that New England was slow to respond to the buying movement this spring, but now that it is under way coal cannot be sent there fast enough to suit the dealers.

Stove remains extremely short, and most dealers are embarrassed for the want of it. They claim that practically every order they receive calls for at least a part of this size, and as they are behind in their deliveries it is causing their customers to withhold payment of their bills pending the completion of their orders. With little or no stove in most of the yards and an abnormal demand from all other markets, it cannot be seen how the requirements are to be filled before fall, by which time it is sure to be renewed most vigorously.

Chestnut has been shipped here much more freely than either egg or stove, and as a consequence most of the urgent cases have been cared for. The dealers have small stocks of this size, but as they now seem to have filled most of their orders they are not quite so insistent in their demands for it; in fact, some shippers believe they may need business for chestnut before the fall orders begin to arrive.

The shippers continue to hold orders for pea coal sufficient to take up the production several weeks in advance, but it must be said that the dealers are not disposing of their tonnage as rapidly as it is being received. Quite a stock is accumulating and a number will be compelled to order the suspension of shipments before many weeks. There seems to be a possibility of the big companies, who without question will hold to their circular price, being compelled to store this size before it comes into its own in the fall. If this happens there is a likelihood, of which we have heard fairly well founded rumors, that the dealers will be charged about 50c. a ton to cover the expense of storing and picking up. This is borne out by the fact that one of the large companies on a small quantity of prepared sizes recently picked up made a charge for this service.

There is no particular activity in the steam sizes. A good tonnage of buckwheat is being taken and some of the smaller shippers claim they have little of this size that is not under contract. The larger producers are still placing a small tonnage in storage and it is believed this will increase up to a month or more. There is a general feeling, broadcast that the industrial revival cannot be long delayed and that beginning with the fall there will be a heavy demand for all steam sizes. Most of the present quantity of buckwheat being sold is being taken in by plants in anticipation of car shortage and other difficulties during the fall and winter. There is no change in the demand for rice and barley. While a good tonnage of rice is being shipped on contracts, there are few sales outside of this, while practically the only outlet for barley now is the city pumping stations, the contract for which was recently awarded to the leading anthracite company at a price 75c. under present quotations.

Shippers report that collections are good. While the accounts are not so closely collected as they were in war times, still it can be said that there is less money outstanding than for several years at this time of the season. Inquiry among the retailers develops that they are gradually giving more credit than they had expected, but they all claim it is only for a short time and is extended to gilt-edge customers.

Bituminous—There is little action in the bituminous trade. The production is about the same as it has been for a couple of months past, most of the output being applied on contract business. It is true that with the settlement of the railroad fuel problem there has been a greater number of inquiries from consumers for both contract and spot coal. Some companies have taken the stand that they have about all the contract business that they desire to handle and do not care to commit themselves to any further tonnage, as they want to be in the position of having some free tonnage when the expected boom actually arrives. Even as it stands now the good coals are hard to get and it is not going to take a very greatly increased general demand for fuel to make the pinch felt. A survey of the plants throughout the city shows gradually decreasing stocks and a frequent tendency on the part of buyers to add to them when they can get

the coal they want. There have been very few price fluctuations, the quotations holding closely within the range of the past six weeks.

BALTIMORE

Little business in soft coal. Rumors of large export contracts. Anthracite scarce.

Little business in bituminous was noticed during the week, while there was evidence of increased activity in the export business. Local business was confined to small spot tradings with prices holding fairly firm and continuing around \$2.75 for the best grade of fuel. Some trading in the better coals was done as low as \$2.50, but most of it sold around the \$2.75 mark. Contracting is still being held back, although buyers are being warned the market is liable to go up rapidly and that unless they evidence a tendency to get under cover many firms will find themselves short when the open market becomes light and there is little coal to be had. Contract figures are slightly above the present open market prices. The opinion here is that mines will not increase production until there is sufficient contract business to warrant a fair price for their product. No change was noted in the price of medium and cheap grade fuels, \$2.30 being the top price for the former and under \$2 for the latter.

The trade heard a rumor during the week that one of the large corporations had been able to close a contract for export amounting to about 3,000,000 tons. It was impossible to verify the report, but it was gossiped pretty well about the city. In most quarters it was taken for granted that it was O. K. South American ports, Sweden, Switzerland and Holland were points to which 28,414 tons of cargo and 3399 tons of bunker coal were carried during the past week.

Receipts of anthracite continue light, and the dealers here are hard put to it to handle the situation in view of the fact that their April orders are still undelivered. The dealers will likely announce a 25c. increase in the price of hard coal to householders on July 1, there being no change to date in the April schedule.

Lake Markets

PITTSBURGH

Runaway market predicted if consumers do not stock up.

Coal operators of the Pittsburgh district express anew their conviction that there will be a coal shortage late in the year. This was brought out forcibly at the last monthly meeting of the Pittsburgh Coal Producers' Association. J. D. A. Morrow chanced to be present and made an interesting address, referring to the fact that the country's coal production thus far this year is 30 per cent. short of production in the same period last year. The Pittsburgh district operators state that if consumers do not take more coal during the next few months a shortage will develop late in the year which will produce a runaway market, and this the operators wish to avoid for various reasons, one of these being the sentimental influence it would exert on wage scale negotiations for the period beginning Apr. 1, 1920.

Coal consumers are acting conservatively and evince no disposition to lay in stocks of coal, although before the coal scarcity of the past two years that was the usual procedure. Excess stocks that consumers held at the close of the war have now been eliminated and current buying has increased somewhat, though it is still only for current consumption. The steel industry shows no further decrease in activity, and there is perhaps a slight increase in mill operations. Lake shipments from the district are fairly heavy and are running at a rate that will readily make up the district's quota for a 20,000,000 ton movement up the lakes for the season. Coal production in the district is in the neighborhood of 60 per cent. of capacity.

Slack is easier in the market while prepared sizes are a shade firmer and mine-run is unchanged. Mines selling slack and prepared coal claim to be securing a shade more than the mine-run average. We quote: Best grades gas coal: Slack, \$1.65 @ 1.85; mine-run, \$2.35; prepared sizes, \$2.60 @ 2.70; Steam: slack, \$1.50 @ 1.70; mine-run, \$1.90 @ 2.35, per net ton at mine, Pittsburgh district.

TORONTO

Coal situation easier. Dealers overtaking delayed deliveries. Less fear of shortage. Bituminous quiet. Industrial crisis over.

The coal situation is considerably easier. Supplies of anthracite are coming forward from the mines in about normal quantities and dealers are gradually overtaking deliveries in arrears. New orders are only taken subject to prices prevailing at time of delivery. There is less fear among consumers of a shortage, and business is getting on a more satisfactory basis. Bituminous is little called for, owing partly to extensive strikes, but the industrial crisis is now over and market conditions are likely to show improvement in the near future.

Quotations for short tons are as follows:

Retail:	
Anthracite, egg, stove, nut and grate.....	\$11.50
Pea.....	10.00
Bituminous steam.....	8.25
Slack.....	7.25
Domestic lump.....	10.00
Cannel.....	11.50
Wholesale f.o.b. cars at destination:	
Three-quarter lump.....	5.75
Slack.....	4.56

BUFFALO

Slight changes in bituminous trade. Consumers still hold off. Anthracite in great demand. Shippers trying to keep lake loading up.

Bituminous—Consumers do not seem to be interested in coal at any price. Jobbers say it requires a good salesman to do business on the road, and that it is almost useless to stay in one's office and attempt to do business. Industries that use steam coal are in no condition to buy lavishly, and in addition the idea still prevails that prices will come down.

Bituminous prices are not steady, quotations remaining about as last week: \$4.55 for thin vein Allegheny Valley sizes; \$4.45 for Pittsburgh and No. 8 five-quarter lump; \$4.50 for same, three-quarter; \$4.05 for mine-run and \$3.65 for all slack, per net ton, f.o.b. Buffalo.

Anthracite—The situation is much the same, except that the hot spell has discouraged ordering somewhat and consumers appear to be filled up, so far as summer stocking is concerned. Users of the chestnut size usually do not buy much till fall, as they are mostly poor people who move a good deal and buy coal only when it is needed. This size of anthracite is therefore more plentiful than either stove or the larger sizes of hard coal.

There is a general shortage of anthracite. Mining suffered during the holiday, almost three days being lost. There is a scarcity of men and it is hard to catch up when mining once gets behind. The winter supply is still a problem. It may be adequate but everybody fears it will not. Much depends on the winter, but no restrictions are likely to be imposed.

The prices of anthracite advanced 10c. a ton on some sizes June 1, and are now quoted as follows:

	F.o.b. Cars, Gross Ton	At Curb, Net Ton
Grate.....	\$8.65	\$10.35
Egg.....	8.65	10.35
Stove.....	8.90	10.40
Chestnut.....	8.90	10.60
Pea.....	7.20	9.25
Buckwheat.....	5.80	7.85

The showing in the lake trade is better, though it is feared that it cannot be kept up if the rail and local demand continues. The amount loaded for the week was 102,125 net tons, of which 13,100 tons cleared for Chicago, 24,000 tons for Milwaukee, 6300 tons for Manitowoc, 3400 tons for Sheboygan, 1825 tons for Sault, Can., 1800 tons for Sault, Mich., 22,500 tons for Fort William and 15,200 tons for Duluth-Superior.

Freight rates continue at 50c. to Chicago and Sault, 47½c. to Milwaukee and Sheboygan, 42½c. to Manitowoc and Fort William and Duluth.

CLEVELAND

Growth in demand is slow, but it is steady and reassuring. Slack is gaining strength constantly, and it is expected that the stockpiles at the mines will be cleaned out by early fall. Many of the larger industrial users of coal now place August as the

time when they again will be operating at 100 per cent. Domestic consumers are still buying heavily, especially of Pocahontas.

Bituminous—Each week sees more consumers of steam coal entering the market and while their buying is of small proportions, it is just that much more than it has been. Last winter's accumulations now are practically out of the way, and the coal being bought today represents actual requirements. Business appears to be picking up gradually, but the pull seems to be hard. In several cases fairly large users of steam coal have foreseen a sudden inflated demand, with consequent soaring of prices, a few months ahead, and are buying while they consider the buying good. The large steel mills in the valley believe the beginning of August will see their order books jammed. The general opinion in Cleveland, too, is that about 60 days must elapse before business becomes really pressing again.

Practically without exception eastern and southern Ohio operators are bulls on the market, and mine operations are being speeded up. The lake trade continues to take all that is sent to the Lake Erie ports. In seeking to market all the coal they can in the lake trade operators are finding themselves pinched on labor. It is safe to say every operator could use at least 20 per cent. more mine workers. The foreign element especially is becoming restless, and is not producing; the greater part of it is awaiting stevedore quarters for Europe. Cars, too, appear somewhat short despite the big surplus reported by the Railroad Administration.

Domestic coal users now are making quite a run on Pocahontas. Except for apartment and public building use, bituminous is a drug on the market. Anthracite demand, while gratifying, is not what most dealers believed it would be. Pocahontas, however, does not stay long on the yards. Talk of another 25-cent advance in price is heard. In the last seven weeks 75 cents has been tacked onto the price of fork-d, while mine-run has continued at \$7.20, delivered.

Lake Trade—Tonnage is reported coming out fast, but with the lake carriers getting good dispatch, none is piling upon the docks. A few days ago 4860 cars, or approximately 240,000 net tons, were dumped in one day; this is a high mark for the season to date. A number of large freighters are coming down light from the head of the lakes to take coal back, whereas the freighters usually go up light for iron ore on the down trip. Receipts of anthracite at Duluth in May totaled 129,700 tons, compared with 56,600 tons last May, while bituminous coal received amounted to 1,039,200 tons, as against 777,300 tons in May, 1918.

DETROIT

Consumers of steam coal continue to hold off on orders. Domestic buying slumps with period of hot weather.

Bituminous—Sluggish inactivity is a prominent feature of the local market for bituminous coal, according to jobbers. Consumers of steam coal seem to be slow to realize that those who delay taking advantage of present opportunities for stocking up may encounter obstacles difficult to overcome when they enter the market later.

Receipts of bituminous are unusually light for this season of the year. Jobbers and wholesalers are not encouraging shipments except on the basis of direct-from-the-mines to consumers. One result of this policy is that little free coal on tracks is reported in Detroit, which is a condition in sharp contrast with the period before the war.

Some of the buyers, however, seem to have formed the opinion that the supply of coal awaiting sale is quite large. This impression is created, the jobbers explain, by the fact that several brokers may be working to sell one consignment and may each in turn offer it to the same group of prospective buyers. Little smokeless coal is available. Lump and egg sizes are said to be virtually out of the market, with mine-run selling at \$2.75 at the mines for a short ton.

West Virginia mine-run brings from \$2.10 to \$2.25 and mine-run from Ohio is quoted around \$2. Slack is apparently difficult to place with Ohio coal quoted at \$1.50 and stock from West Virginia at about \$1.85. Hocking lump is held at \$2.50, while West Virginia gas or splint lump is quoted at \$2.75 and three-quarter lump at about \$2.50.

Anthracite—Retailers find that the extreme heat of the last few days has produced a noticeable reduction in volume of

business coming from household consumers. Anthracite is not reaching the city in large amount, but the principal dealers seem to be getting sufficient stock to supply customers. Efforts of a number of retailers to encourage early buying of anthracite have not brought the volume of orders expected.

Lake Trade—Shipments of coal on the lake routes are holding at a considerable tonnage. Despite the holiday May 30, vessels loaded 966,063 tons in the week ending May 31, of which 39,137 tons was fuel coal. Some vessels are making the downbound trip without cargo to load coal.

COLUMBUS

Improvement is reported in the domestic and lake trade. Steam business is still slow. Fancy domestic grades are strong. Screenings still drag.

The domestic coal trade is now active in central Ohio territory. Buying on the part of retailers is more noticeable as stocking has now started to a certain extent. The fancy grades are moving actively. Pocahontas is selling well and the same is true of West Virginia splints and other smokeless and semi-smokeless grades. Retail stocks are not large in any section, and consequently there is a fairly good buying movement. Prices for Pocahontas continue to advance and the usual figure is \$4 at the mines. Consumers are placing orders for their next winter's supply, to be put in in June and July.

Steam business is quiet in most sections. There is a better demand for screenings, which has been the hardest grade to dispose of. Reserve stocks are generally used up and going concerns are now buying in the open market, where rather low prices are offered. Iron and steel concerns are not using so large a tonnage as formerly. Rubber plants are busy but they have some reserve stocks on hand. General manufacturing is gradually expanding and as a result a better steam demand is expected within the next few months.

The lake trade is running along about the same as usual. The movement is slowly increasing but has not reached the proportions of last year. Uncertainty as to price is still holding up some lake contracts. Dock interests are busy filling their docks at the head of the lakes. Vessels are plentiful and chartering is going on fairly well.

Production is not increasing in any of the Ohio fields. This is due to the uncertainty in the steam situation. The Hocking Valley is credited with about 50 per cent. of normal during the past week, and operations in the Pomeroy Bend field were about the same. Eastern Ohio is producing about 55 to 60 per cent. of normal. Other fields are not showing up very well.

CINCINNATI

Market comparatively quiet, but future looks encouraging. Labor troubles expected. Prices hold up. Pocahontas coal scarce.

The market is comparatively quiet. There has been no startling business transacted during the past week, but the outlook is encouraging. A survey of the local dealers shows an improvement, and the near future is expected to see the resumption of the normal trend of business. All the local dealers are dubious about the conditions for this fall, and are endeavoring to educate the consumer of the possibility of a serious shortage. There is also a new problem becoming more and more conspicuous as the weeks pass on. The local dealers are anticipating labor trouble at the mines along about the time when it will do the most harm.

The prices of coal in Cincinnati continue to remain the same as the past few weeks, but the heavy demand in some lines has caused a shortage. Coal from the Pocahontas fields is hard to obtain. There is an acute shortage in this particular grade, and the local dealers claim that it is out of the question to obtain any of this coal. Anthracite also is running short in this vicinity, with no immediate prospects of a normal supply being obtained.

LOUISVILLE

Block demand increasing with stronger market as result of better consumer stocking. Steam grades generally draggy, with spot coal selling at considerably under market. Contract prices fairly firm.

The market as a whole has shown little price change, other than a little stiffening on the part of concerns with fair orders on hand. Domestic coal is strong in price, but steam coal is selling at all kinds of

prices. However, industrial consumption is slowly but steadily improving as old stocks run out, but little contract making is being indulged in at this time.

Consumers are beginning to get a little uneasy, and are placing fair orders, with the result that retailers are fairly busy, and are buying nicely. During the past three weeks one retailer has developed business until he is now operating four out of his six trucks, which is a considerable improvement considering the fact that he had been operating but one small truck.

Some of the eastern Kentucky mines are operating full, while others are operating as full as labor conditions will permit. There appears to be a general shortage of labor, resulting in only about 70 per cent. operations for eastern Kentucky.

The Lake movement is now in full swing, and some fair business is coming from byproduct, gas plants and other consumers.

There is also a good deal of coal moving into textile districts of the South, and to Southern ports for export or bunkering. Jellico, Straight Creek and Blue Gem block coal is selling at higher prices, ranging from \$3.25 to \$3.75 per ton. Nut and slack and mine-run from these districts is selling at approximately the same prices as good eastern Kentucky.

The demand is largely for better grades of coal, resulting in low grades going begging. In steam coal the better grades are being quoted at such low prices that operators making low grades have no chance to compete.

BIRMINGHAM

Domestic market shows great strength and little free coal can be found. Prices advance on all grades. Little activity in steam trade, but schedules remain firm and there is no accumulation in the hands of operators.

Inquiry for domestic fuel is exceedingly brisk for this season and it is practically impossible to find any free coal of the higher or even the medium grades. Schedules adopted Apr. 1 providing for an increase of 10c. per ton per month through September have been abandoned except on contract business, and there is a possibility of a runaway market before fall. Quotations on domestic grades are as follows per net ton mines for lump and nut:

Cahaba.....	\$4.50@5.00
Corona.....	3.50@3.75
Black Creek.....	4.00@4.50
Carbon Hill.....	3.25@3.50
Climax and Montevallo.....	5.00
Big Seam.....	3.00

The steam trade is still drifting along quietly, but brokers predict a decided change for the better between now and July 1, when a number of large railroad contracts expire and will have to be renewed. It is thought that this will bring about more active buying from commercial consumers generally. Government prices are holding firm and when the market again becomes active sales will be based on that schedule.

Coke

CONNELLSVILLE

Operators have still stiffer views. Sliding scale contracts may be made. Production slightly increased.

Coke operators have become even stiffer in their views as to the value of coke for the second half of the year, owing no doubt to the better reports lately coming from the iron and steel industry, and it now seems improbable that it will be possible for operators and furnacemen to get together on a flat price for second half contracts. In the majority of cases May and June settlements on monthly adjustment contracts were at \$4. The furnaces would hardly care to pay as much as that as a flat price over the second half, while on the other hand there is no operator who would accept such a price. They all feel that even if coke is hardly worth \$4 now it will be worth much more later in the year. Accordingly some effort is being made to figure out sliding scale contracts for presentation to furnacemen. The difficulty is experienced, however, that present pig iron prices are more or less artificial, representing the remains of wartime control. Taking basic pig iron at \$25, valley furnace, which is approximately the quotable market now, there may be a decline

in the next few weeks and afterward a recovery based on demand. If in such circumstances a \$25 price were again reached, the coke operators feel that the furnaces would be able to pay a better price for coke than they can now, when pig iron is also quotable at \$25. There is some talk of formulating scale contracts whereby \$25 pig iron would call for \$4.75, with other prices in proportion, with a proviso that until the pig iron market shows strength of its own, a special price, say \$4, will be made.

Foundry coke is in better demand and consumers are taking more interest in the better grades. Operators would not sell foundry coke on contract at prices now ruling for spot, particularly as the usual contract runs for a twelvemonth. The spot market remains quotable at \$3.85@4 for furnace and at \$4.50@5 for foundry, depending on grade, per net ton at ovens.

The "Courier" reports production in the Connellsville and Lower Connellsville region in the week ended May 31 at 111,335 tons, an increase of 3262 tons.

Buffalo—The only indication of change in the dull state of the smelting trade is the chartering of 100,000 tons of iron ore to be brought down at once by boat to Lake Erie ports. This is the first stir of the season, and is small in amount, but it may be the forerunner of much more. Local furnaces are running light and are not buying much ore, which is still quoted at \$7.25 to \$7.60 for 72-hour Connellsville foundry, \$6.60 for 48-hour furnace and \$6.10 for off grades.

Middle Western

GENERAL REVIEW

Conditions more hopeful, with plenty of coal moving forward. Price increased on good grades. Labor shortage in fall.

The coal market in the Middle West is at last showing some hopeful signs of a return to a healthy state of activity. The public are buying more freely than heretofore, and each day shows an improvement over its predecessor. A considerable tonnage is moving daily on the open market, and a number of contracts have been closed, although no big contracts. Prices have advanced on prepared sizes on all of the high grade coals mined in these fields, and further advances are predicted for July 1. Franklin County prepared coals are now \$2.85 per ton f.o.b. mines, and we understand from a reliable source that some Indiana Fourth Vein lump sold as high as \$2.95 f.o.b. mines. The retail trade is affected by these price increases, as there have been few, if any changes in steam coals, although the railroads appear to have prevailed upon certain operators and jobbers to shade their prices.

What little eastern coal is moving into the Middle West is sold, and will continue to be sold, at good prices. This is a decided improvement over conditions a month or so ago, at which time the gas and by-product people received quotations in every mail from West Virginia operators quoting prices on byproduct coal from 50c. to a dollar per ton under the Fuel Administration prices. High grade eastern coals for domestic purposes are in great demand and hard to get. It is generally believed that whatever eastern coal is to move into the west will have to move fairly promptly, as the demand in the east is increasing rapidly.

The labor situation at the Middle-Western mines is continuing without much change. Men are leaving the coal industry for more favorable fields, and the big exodus of the foreign element continues. As conditions are, at present, Illinois and Indiana operators have as many men as are needed, but when the demand for coal comes, as it will come, and soon, it will find a serious shortage of labor at our mines. As no new labor is coming into the field, it is easy to understand why the operators are so anxious to have their favored customers go into the fall and winter months with an adequate storage pile.

CHICAGO

Steam coal demand still inactive, while domestic coal demand is picking up. Little anthracite.

Trade conditions continue without much change, especially in regard to steam coal. The demand for mine run and screenings keeps up, perhaps a little better than in the immediate past, but the movement of steam coal into the Chicago market is still far below normal. It is believed, however, that the steam buyers will come into the market heavily a few weeks from now, when they understand what the coal situation is today.

The domestic situation is changed some. Dealers realize that from now on it will be extremely difficult to obtain eastern coals, such as Pocahontas, etc., in sufficient quantities and they are therefore turning to the nearer fields such as Franklin County and the Indiana Fourth Vein district. Operators in the two districts mentioned above report a great improvement in their Chicago trade, which they believe will continue for some time to come.

We understand that some of the Chicago retailers are having difficulty in obtaining anthracite, and are far behind on their orders. It is predicted by some very closely in touch with the market that what is now true of anthracite will also be true of all high-grade domestic coals sixty or ninety days from now.

MILWAUKEE

All grades of anthracite advanced 10c. per ton, with the exception of buckwheat. Market continues quiet, with selling movement slow.

The coal market at Milwaukee continues quiet. Dealers say deliveries are only fair in volume, due apparently to a disposition on the part of consumers to hesitate at paying present prices. However, an addition of 10c. per ton on all grades of anthracite except buckwheat, which became operative June 1, may tend to dispel this feeling. Dealers have been looking for an advance in bituminous coal also, as Western operators are charging from 75c. to \$1 more at the mines; but thus far the soft-coal schedule remains undisturbed.

Receipts by lake thus far aggregate 177,980 tons of anthracite and 725,672 tons of soft coal, a gain of 76,519 and 271,131 tons respectively over the receipts during the same period last year.

The City of Milwaukee will soon be in the market for about 60,000 tons of coal, mainly bituminous. During the war the city was supplied through a pooling arrangement between city dealers, but competitive bids will now be sought.

Prices of anthracite are now as follows: Chestnut, \$12.40; stove, \$12.30; egg, \$12.10; pea, \$10.90; buckwheat, \$9.75.

ST. LOUIS

Business generally quiet with increase in inquiries from country for threshing coal. A slight increase in local call for domestic coal, while steam continues to lag. Condition shows little improvement.

The local situation shows some improvement, but not to any marked extent. Orders for storage coal have been more numerous in the last week, and there will no doubt be a general movement from this time on that will not reach its highest point until perhaps July or August so far as storage fuel is concerned for domestic purposes. The greater portion of that moving now seems to be anthracite. There is an increasing call for smokeless coal.

On the Illinois coals the Carterville grades are leading. The call for Arkansas coal is light and there is nothing to indicate that any of this fuel will move in here in tonnage worth considering.

Steam business continues to have a depressing effect on the market. The large steel plants in East St. Louis and Granite City are running short time, and some of them have suspended altogether, putting a large tonnage of steam coal on the market. This has kept screenings and small nut down. The steam business throughout the country does not seem to be anywhere near normal either.

Conditions in the Standard field show no improvement. As a matter of fact, they continue to grow worse. The steam-coal problem is a serious one, and in the face of a poor steam market the prices on domestic sizes seem to go down instead of up, on account of the over-production. Nearly every mine in the field is selling coal at about the cost of production and below, in order to keep their organization together, anticipating a big demand in the near future. Competent observers contend there will be no extraordinary demand for Standard coal until the middle of the winter, and then only if the weather is severe and an unusual car shortage occurs. The mines continue to work two and three days a week. The railroad tonnage has increased some this week.

In the Mt. Olive field the railroad tonnage does not seem to be large, but there is a fairly good movement of both steam and domestic to Chicago and the Northwest. A considerable tonnage of this coal, especially the washed sizes, was recently contracted for at Kansas City, and some is moving to Omaha. The conditions in the Mt. Olive field are satisfactory, everything considered.

In the Carterville field of Williamson and Franklin County, Illinois, and the Duquoin field, the one great problem now is the steam sizes. At Benton, Ill., it is estimated there will be 100,000 tons of coal piled up at the mines, and at other mines in the field screenings and sizes from No. 2 to No. 4 have been piled up. This is accounted for by the fact that industrial conditions in the Middle West are bad, and there is no call for steam coal that usually at this season of the year was greatest in demand.

The demand for domestic sizes shows a steady improvement, especially to the Northwest. Locally there is a small tonnage moving in, but this is not a factor in the situation. Cars are plentiful and the movement is good, and a general way conditions show improvement, except on steam coal. Some mines still continue idle and all are working short time. The railroad tonnage from this field shows up fairly well and is the only important factor in keeping the mines going at this time.

Coal and Coke Securities

New York Stock Exchange Closing Quotations June 9, 1919

STOCKS		Ticker	Bid	Asked	BONDS		Bid	Asked
		Abvn.						
American Coal Co. of Allegheny.....	(ACT)		45	...	Cahaba Coal, 1st Gtd. 6s, 1922.....		90	...
Burns Brothers, Com.....	(BB)		149 1/2	150	Clearfield Bituminous Coal, 1st 4s, Ser. A, 1940.....		71	...
Burns Brothers, Pfd.....	(BB)		99 1/2	115	Colorado Fuel & Iron, Gen. 5s, 1943.....		91	93 1/2
Central Coal & Coke, Com.....	(CK)		55	...	Colorado Indus. 1st Mtg. & Col. Tr. 5s, 1934.....		80	...
Central Coal & Coke, Pfd.....	(CK)		63	...	Consolidation Coal of Maryland, 1st Ref. 5s, 1950.....		80 1/2	...
Colorado Fuel & Iron, Com.....	(CF)		50 1/2	51	Jefferson & Clearfield Coal & Iron, Sec. Mort. 5s, 1926.....		96	...
Colorado Fuel & Iron, Pfd.....	(CF)		103	125	Lehigh Valley Coal, 1st Gtd. 5s, 1933.....		98 1/2	100 1/2
Consolidation Coal of Maryland.....	(CGM)		75	...	Lehigh Valley Coal, Gtd. Int. Red. to 4%, 1933.....		79 1/2	...
Elk Horn Coal, Com.....	(EH)		99 1/2	99 1/2	Lehigh Val. Coal & Nav. Con. S. F., 4 1/2s, Ser. A, 1954.....		90	...
Elk Horn Coal, Pfd.....	(EH)		...	47	Pleasant Valley Coal, 1st S. F. 5s, 1928.....		80 1/2	...
Island Creek Coal, Com.....	(ICR)		39	...	Pocahontas Coal & Coke, Joint 4s, 1941.....		85	...
Island Creek Coal, Pfd.....	(ICR)		75	...	Pocahontas Con. Collieries, 1st S. F. 5s, 1957.....		8 1/2	88
Jefferson & Clearfield Coal & Iron, Pfd.....	(JF)		40	...	Roch. & Pitts. Coal & Ir., Helvetia Pur. Money 5s, 1946.....		98	...
New Central Coal of West Va.....	(NCC)		5	...	St. L., Rocky Mnt. & Pac. Stamped 5s, 1955.....		...	83
Pittsburgh Coal, Com.....	(PC)		64 1/2	65	Tenn. Coal, Iron & R.R., Gen. 5s, 1951.....		93	95
Pittsburgh Coal, Pfd.....	(PC)		92 1/2	94 1/2	Utah Fuel, 1st Sinking Fund 5s, 1931.....		87	...
Pond Creek Coal.....	(PD)		19 1/2	20	Victor Fuel, 1st Mtg. Sinking Fund 5s, 1953.....		55	70
Virginia Iron, Coal & Coke.....	(VK)		70	72	Virginia Iron, Coal & Coke 1st 5s, 1949.....		85 1/2	88 1/2